

From: vanthof (vant)
Sent: Monday, July 31, 1995 11:59 PM
To: Tom Laidig [tau]
Cc: hopper (Mark Hofmann); tbr (Tim B. Robinson); geert (Geert Rosseel); wampler (Kurt Wampler); albers (Daniel Albers); vanthof (Dave Van't Hof)
Subject: Re: euterpe tapeout? here we go...

Tom Laidig [tau] writes:

>I just got buttonholed by Jack, Al, and Anh for an impromptu meeting
>about euterpe tapeout, given the edict that we must have euterpe
>silicon by Dec 31. I explained that euterpe, as it exists now, does
>not meet the 'compromise' design rule set developed last week, and I
>estimated 3 months of layout work before it could be made to do so.
>

>Given this, Al and Anh agreed that the best move is to tape out the
>baseplate layers (currently defined as 010-140 -- all but metals, SDEC,
>and silicide) ASAP in their current form, and pressed me for an
>estimate of how soon this could happen. I made the possibly rash
>statement that I thought we might be able to tapeout the baseplate on
>Aug 14. (Jack mentioned some 1- or 2-udr well-well and well-nactive
>spacing violations, to which Al said 'waive them')

I'll check my lower layer fracture flow generation, but I think it's basically done. I think all we need to do is make sure the chip meets the rules.

>After some argument, we settled on Sep 1 as the target date to tape out
>the layers up through M1 (plus any more metals we can get out by then),
>with the remaining metal layers taping out promptly thereafter.

According to what rules? If we are going to tape out euterpe to the current rule set, then I think we can do upto metall1. if we are to meet the compromised set, then your estimate of 3 months is more accurate.

Oh by the way, 'promptly', is that the 'new math' equivalent for time speak? :-)

>
>I hope I didn't commit (however tentatively I tried to do so) to
>anything _too_ rash. My estimates were predicated on a lot of stuff I
>don't know enough about, including, but surely not limited to:

>
> There's a frame that is ready, or very nearly so
>
> The only problems in the lower layers are the spacing violations
> mentioned above
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> We have few metal lvs and drc problems, perhaps limited to the short
> found recently in the cache

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> A pad, seal ring, crack protection ring, and perimeter power bus
> that makes people happy can be developed in a timeframe never
> before seen at this company (BTW, Al said basketweave perforation
> in the pads would be fine)

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>Anyway, like I say, I hope I didn't misrepresent things too badly. If
>I did, feel free to blame me. Jack will be visiting some of you very
>soon, I expect, to try to convince you all to agree to this. The
>impression I have now is that taping out euterpe is our highest
>priority, but I dunno -- the highest priority seems to change several
>times a week as far as I can tell.

>Are we having fun yet?

>

Quick, someone get the tar, I'm sure Hopper can scrounge up a few rooster feathers...

--
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089

vanthof@microunity.com 1 408 734-8100

"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just
not in this context." The Tick to Thrackazog

From: tbr
Sent: Monday, July 31, 1995 11:45 PM
To: Daniel Albers
Cc: geert@microunty.com; hopper@microunty.com; tau@microunty.com; Tom Laidig [tau]; vanthof@microunty.com; wampler@microunty.com
Subject: Re: euterpe tapout? here we go...

Daniel Albers wrote (on Mon Jul 31):

> the words of Tom Laidig [tau]:
>
> [snip]
>
> I hope I didn't commit (however tentatively I tried to do so) to
> anything too rash. My estimates were predicated on a lot of stuff I
> don't know enough about, including, but surely not limited to:
>
> There's a frame that is ready, or very nearly so
>
> [snippitte, snip, snip]
>

The frame is "nearly" ready. The one that is check'd in is completely wrong. But I believe I can have a good frame put together by the guestimated tapeout dates...

Why does the frame need to be any different from the one (I assume) we have ready for pollux?

Tim

From: Daniel Albers [albers@micrunity.com]
Sent: Monday, July 31, 1995 11:11 PM
To: Tom Laidig [tau]
Cc: hopper@micrunity.com; tbr@micrunity.com; geert@micrunity.com;
vanthof@micrunity.com; wampler@micrunity.com; tau@micrunity.com
Subject: Re: euterpe tapout? here we go...

> the words of Tom Laidig [tau]:
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> [snip]
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Dan

--
Daniel Albers albers@micrunity.com MicroUnity Systems Engineering, Inc.
255 Caspian Way, Sunnyvale, CA (408) 734-8100

"Evil is just plain bad! You don't cotton to it. You gotta smack it in the nose with the rolled-up newspaper of goodness! Bad dog! Bad dog!"

- The Tick.

ANSWER TO ACTION

From: hopper (Mark Hofmann)
Sent: Monday, July 31, 1995 3:22 PM
To: Tom Laidig [tau]
Cc: tbr (Tim B. Robinson); geert (Geert Rosseel); vanthof (Dave Van't Hof); wampler (Kurt Wampler); albers (Daniel Albers); tau
Subject: Re: euterpe tapeout? here we go...

Tom Laidig [tau] writes:

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A pad, seal ring, crack protection ring, and perimeter power bus that makes people happy can be developed in a timeframe never before seen at this company (BTW, Al said basketweave perforation in the pads would be fine)

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Are we having fun yet?

Mondo Fun.

I think 1 Sep is doable. I think 14 Aug is doable. Indeed (pick any date) is doable. Since we don't know all the things we need to do to make this chip work but we can make dark stabs at some I think the best course is to pick when we want something (31 Dec) and work backward. I think this is basically what was done.

So, I have no problem with this.

As to the question of which is higher priority- Euterpe or S2- I defer to the gods.

Brass tacks:

It is therefore agreed to waive the SDEC/ISO problem (intersections)?
Does everyone understand what pads we will use on Euterpe?
Are we waffling poly/metal- I mean basket weave, slots, or ...?
Are via layers not waffled, but Contact Ped is ?

Let's pick a date and make it a hard date, I mean no fudging (since we are waiving rules already) and "just do it".

-hopper

From: jack (Jack Wenstrand)
Sent: Monday, July 31, 1995 10:18 PM
To: tbr; geert; manser; mouss; al; anh; tom
Subject: Euterpe

Here are notes from some Euterpe meetings today.

tbr, manser, geert, mouss, jack
2:30

- * A DRC check was run over the weekend on Euterpe. We are in much better shape than was thought; several cells have been cleaned up as a result of the Pollux reviews. We should be able to produce a Euterpe consistent with our current design rules. One exception: a 1 UDR active to well violation will remain.
- * The list of structures for review include, in priority order:
 - a) Register file
 - b) Pads
 - c) Chip infrastructure (bias, clock, power distribution)
 - d) PLL (required for bias)
- * Schedule constrains imply that:
 - a) We cannot implement all of the compromise design rules.
 - b) The lower level layouts must be ready for fracture by 9/25.
 - c) The upper level layouts must be ready by 9/22.
- * We should have Euterpe DRC clean and tape out all levels on 9/1. The second metal tape out can still occur; doing a full tape out first will cost some extra money, but it will maximize our chances of meeting the overall Euterpe schedule.
- * To continue progress, Steve will work resource allocation/plan to ensure Euterpe tapes out on schedule.
- * Jack will call a meeting tomorrow, to include Al, Anh, and Paul, to set priorities for work to maximize the probability of success on Euterpe within the schedule constraints.
- * Jack will talk to Al to set the stage for register file review tomorrow at 11.
- * Geert will continue progress on contract mask designers

al, anh, tom, jack
7pm

- * The fab would prefer to have a Euterpe which meets compromise design rules. Failing that, they want

baseplate ASAP. This permits:

- as much time as possible for fabrication in the event of unfavorable down-time events, and
- the best shot at an extra turn.

- * Full implementation of the compromise design rules is inconsistent with schedule constraints.
- * A proposal for schedule is as follows:
 - baseplate (through 140) tapeout 8/14.
 - M1 tapeout 9/1, with the rest following ASAP.
- * Layout reviews should begin following on the baseplate work. Al would like to see the pad first.
- * Al prefers not to meet to set priorities for incremental design work at this time.

From: tom (Tom Laidig [tau])
Sent: Monday, July 31, 1995 10:04 PM
To: hopper (Mark Hofmann); tbr (Tim B. Robinson); geert (Geert Rosseel); vanthof (Dave Van't Hof); wampler (Kurt Wampler); albers (Daniel Albers)
Cc: tau
Subject: euterpe tapeout? here we go...

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Anyway, like I say, I hope I didn't misrepresent things too badly. If I did, feel free to blame me. Jack will be visiting some of you very soon, I expect, to try to convince you all to agree to this. The impression I have now is that taping out euterpe is our highest priority, but I dunno -- the highest priority seems to change several times a week as far as I can tell.

Are we having fun yet?

--

From: tbr
Sent: Monday, July 31, 1995 7:59 PM
To: vo (Tom Vo)
Subject: RE: Now we got 2

Tom Vo wrote (on Mon Jul 31):

Since tapeout means having a good tape in your hand , you're way ahead of me . With all the PCI bugs deepak and agc found so far , we're in the pits .

Does this mean there are more than the one known problem as of late last week? I'd not heard of any new ones.

Congratulations .

Thanks. But now we get to fix up the DRC's (again) .

Tim

From: vo (Tom Vo)
Sent: Monday, July 31, 1995 2:05 PM
To: tbr (Tim B. Robinson)
Subject: RE: Now we got 2

Since tapeout means having a good tape in your hand , you're way ahead of me . With all the PCI bugs deepak and agc found so far , we're in the pits .

Congratulations .

From: vanthof (vant)
Sent: Monday, July 31, 1995 12:12 AM
To: Geert Rosseel
Cc: hopper (Mark Hofmann); rich (Rich McCauley); tau; tbr (Tim B. Robinson); vanthof (Dave Van't Hof)
Subject: Re: pollux : where to go from here ?

Geert Rosseel writes:

>
>
> Here is the status of pollux :
>
> LVS : clean

Cool! I was worried that all the pad edits I did would screw something up.

>
> CSYN : 5 errors : 4 we will waive (need csyn tool enhancements)
> 1 error in pll module needs investigating
>
> DRC : 2 "real" errors : GTLB active to well spacing
> MOD 6 floating poly (arya needs to
> investigate)

I believe the active to well spacing is off by 1 udr (which is .05 microns). We may be able to get Al and Paul to waive this error this one time. Especially since we will most likely redraw most of this to meet the compromised drc rule set.

>
> lot's of notch and different type of metal errors
>
>
> I suggest that we :
>
> 1. understand the pll csyn error
> 2. look at the mod6 floating poly
>
> and then freeze the database for tape-out .
>
> Any comments ?
>
>
> Geert

Sounds good if we can get the waiver on the gtlb error.

Dave
--
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089
vanthof@microunity.com 1 408 734-8100
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just not in this context." The Tick to Thrackazog

From: geert (Geert Rosseel)
Sent: Sunday, July 30, 1995 2:04 PM
To: geert@microunity.com; hopper
Cc: rich; tau; tbr; vanthof
Subject: Re: pollux : where to go from here ?

Is the GTLB active to well spacing DRC a show-stopper?

I don't know. I want to waive it. We've always said that if some modules are not perfect, we would tape-out anyway. This is such a case.

Pollux pads are O.K.

Geert

From: hopper (Mark Hofmann)
Sent: Sunday, July 30, 1995 6:36 AM
To: Geert Rosseel
Cc: rich (Rich McCauley); tau; tbr (Tim B. Robinson); vanthof (Dave Van't Hof)
Subject: Re: pollux : where to go from here ?

Geert Rosseel writes:

Here is the status of pollux :

LVS : clean

CSYN : 5 errors : 4 we will waive (need csyn tool enhancements)

For future work: is Fwo aware of what needs to be done here?

1 error in pll module needs investigating

DRC : 2 "real" errors : GTLB active to well spacing
MOD 6 floating poly (arya needs to investigate)

lot's of notch and different type of metal errors

I suggest that we :

1. understand the pll csyn error
2. look at the mod6 floating poly

and then freeze the database for tape-out .

Any comments ?

Is the GTLB active to well spacing DRC a show-stopper? Do you want to waive that?
Do any of the Pollux pads need extra massaging for tapeout (Probably to a flow like that used on Sisyphus I)?

If we can convince Al/Paul into accepting the die as it stands as a test vehicle for fab use then I think we should go ahead with it.

Geert

-hopper

From: geert (Geert Rosseel)
Sent: Sunday, July 30, 1995 1:28 PM
To: hopper; rich; tau; tbr; vanthof
Subject: pollux : where to go from here ?

Here is the status of pollux :

LVS : clean

CSYN : 5 errors : 4 we will waive (need csyn tool enhancements)
1 error in pll module needs investigating

DRC : 2 "real" errors : GTLB active to well spacing
MOD 6 floating poly (arya needs to investigate)

lot's of notch and different type of metal errors

I suggest that we :

1. understand the pll csyn error
2. look at the mod6 floating poly

and then freeze the database for tape-out .

Any comments ?

Geert

From: hopper (Mark Hofmann)
Sent: Saturday, July 29, 1995 3:56 PM
To: Tim B. Robinson
Cc: vant; wampler@microunity.com
Subject: Re: 1GHz euterpe

Tim B. Robinson writes:

Will removing these qualifiers reduce the routing success rate any?

Don't think so. This runs after the route is complete.

Kurt confirmed that.

Now, if we can just arrive at a set of tape-out synthesis rules that don't invalidate our layout, but that the Fab can build, we could well see functioning parts. Al mentioned Friday that they had done an early 2-layer airbridge experiment that looked promising. I haven't seen the SEM photos yet, but hope to on Monday.

I think this is the focus of our next effort. As quickly as we can we need to converge on a set of tapeout rules so that Dave can turn these into a flow so that we can process Euterpe. Then we need to snapshot this rule flow to which we are taping out this set of euterpe masks, so that we can refer to it when questions arise at a later date.

We should snapshot technology. Do we need tools too?

I think the technology snapshot is sufficient. Tools would be nice, though.

-hopper

From: tbr
Sent: Saturday, July 29, 1995 9:44 PM
To: hopper (Mark Hofmann)
Cc: vant; Kurt Wampler
Subject: Re: 1GHz euterpe

Mark Hofmann wrote (on Sat Jul 29):

Kurt Wampler writes:

```
tbr writes:  
-----  
>You did it:  
>***** Iteration: 1 *****  
>***** DC Load Calculations *****  
>No errors at 1GHz!!!!!!  
>  
>We just need to get the DC load problems signed off . . .
```

Fantastic! A team effort, to be sure. Too bad Bill Z. didn't stick around to see it reach this milestone.

It would be appropriate to copy this dff into the snapshot and re-run the export rule in the Makefile before we launch the LVS. I would also like to recommend that we remove the "-v1h" and "-v2h" qualifiers on the twinvia pass in "Makefile.vo". These are soft constraints that cause the twinner to always try to place vias horizontally; this reduces its success rate slightly. I don't have a very up-to-date copy of the Euterpe source tree checked out, so it would be better for you to make and release this change before re-running the export.

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Tim

From: tbr
Sent: Saturday, July 29, 1995 9:42 PM
To: wampler (Kurt Wampler)
Cc: hopper
Subject: Re: 1GHz euterpe

Kurt Wampler wrote (on Sat Jul 29):

tbr writes:

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Releasing now.

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Sounds promising.

Tim

From: hopper (Mark Hofmann)
Sent: Saturday, July 29, 1995 12:01 PM
To: Kurt Wampler
Cc: tbr (Tim B. Robinson); vant
Subject: Re: 1GHz euterpe

Kurt Wampler writes:

tbr writes:

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- Kurt

-hopper

-thanks,
hopper

thanks,
mark hofmann
hopper@microunity.com
408 734 8100

From: wampler (Kurt Wampler)
Sent: Saturday, July 29, 1995 6:55 PM
To: tbr
Cc: hopper
Subject: Re: 1GHz euterpe

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- Kurt

From: tbr
Sent: Saturday, July 29, 1995 2:23 PM
To: wampler (Kurt Wampler)
Cc: dickson
Subject: Re: bad paths

Kurt Wampler wrote (on Sat Jul 29):

tbr writes:

>Get these 2 and we are done! There are some D load problems and I
>want a sign off from geert/bill on those.
>
> [snip]

OK, I've mucked around in the last 2 paths. On the first one, I found that one of the nets had a number of M2 segments that I was able to promote to M4; should be enough to shave off 1.52ps.

On the second one, I found a hairpin maze route on M2 that took a very circuitous path between two nearby pins. I blew away the whole route and completed it in M3/M4; should have improved that leg substantially.

Same file as before: /n/gamorra/s3/wampler/eurip/chip_euterpe-iter.dff

Maybe it'll meet timing this time? My fingers are crossed...

Sorry, I was out for a while. Running now.

- Kurt

[P.S. - just a subjective observation: this route is a lot better than the routes I was working on in April where I would spend hours trying to find a way to complete a wire in some of the more dense sections. None of the wires I've operated on in this tuning operation were anywhere near as difficult as some of those early experiences. By this, I infer that you've made *dramatic* improvements with the placement.]

Actually I think most of the improvement has come from single ending more busses, rather than much in the way of placement changes. Most of that work is really rich's doing. I think I've made significant improvements from a timing perspective by playing with the detail so of the routing order.

From: wampler (Kurt Wampler)
Sent: Saturday, July 29, 1995 1:29 PM
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From: tbr
Sent: Saturday, July 29, 1995 10:19 AM
To: wampler (Kurt Wampler)
Cc: dickson; geert
Subject: Euterpe bad route fixes

Kurt Wampler wrote (on Sat Jul 29):

Good morning,

I have finished going through the paths with timing violations, and have shortened all of them, I think. The file:

/n/gamorra/s3/wampler/eurip/chip_euterpe-iter.dff

now contains these improvements. There's a new netcap file; I've verified that the total capacitance went down for everything I touched, some more dramatically than others.

Could you have another go with topt and we'll see if by some miracle I got enough wire length out to meet the timing budget?

2 paths exceeded cycle time !!!!

Should have the details in a moment.

Tim

From: tbr
Sent: Saturday, July 29, 1995 9:37 AM
To: wampler (Kurt Wampler)
Subject: Euterpe bad route fixes

Kurt Wampler wrote (on Sat Jul 29):

Good morning,

I have finished going through the paths with timing violations, and have shortened all of them, I think. The file:

/n/gamorra/s3/wampler/eurip/chip_euterpe-iter.dff

now contains these improvements. There's a new netcap file; I've verified that the total capacitance went down for everything I touched, some more dramatically than others.

Could you have another go with topt and we'll see if by some miracle I got enough wire length out to meet the timing budget?

I'll start it up now.

Tim

From: wampler (Kurt Wampler)
Sent: Saturday, July 29, 1995 2:53 AM
To: tbr
Subject: Euterpe bad route fixes

Good morning,

I have finished going through the paths with timing violations, and have shortened all of them, I think. The file:

`/n/gamorra/s3/wampler/eurip/chip_euterpe-iter.dff`

now contains these improvements. There's a new netcap file; I've verified that the total capacitance went down for everything I touched, some more dramatically than others.

Could you have another go with topt and we'll see if by some miracle I got enough wire length out to meet the timing budget?

- Kurt

From: tbr
Sent: Friday, July 28, 1995 11:20 PM
To: vanthof (vant)
Cc: geert (Geert Rosseel); tau; Tom Laidig [tau]; vanthof (Dave Van't Hof); wampler (Kurt Wampler)
Subject: Re: looking for euterpe.ly

vant wrote (on Fri Jul 28):

Tom Laidig [tau] writes:

>I'm looking for the most up-to-date euterpe.ly to get a list of layouts
>that need to be released. The one in the snapshot doesn't seem very
>new:
>
> 61 -rw-r--r-- 1 chip caddev 62038 Apr 17 12:01 euterpe.ly
>
>Dave said there was one in ~vanthof/compass/mobi/euterpe/tapeout, but a
>`find' failed to find a file called euterpe.ly anywhere under
>~vanthof/compass.
>
>For the moment, I'm using the one in the snapshot to get my cell list.
>If anyone has a better one, I'll use it.

Sorry, I mis-stated what I meant to say. There is a euterpe.ly found in the search path specified in the vlsi.boo found in that directory.

The latest one is now:

```
0 -rw-r--r-- 1 chip          0 Jul 28 20:02 chip_euterpe-iter.ly
1 -rw-r--r-- 1 chip          646 Jul 28 20:02 rbaseplate.ly
61 -rw-r--r-- 1 chip         62038 Jul 28 20:02 euterpe.ly
18 -rw-r--r-- 1 chip        17795 Jul 28 20:02 real_euterpetop.ly
35 drwxr-xr-x 2 chip       35328 Jul 28 20:10 .
tbr@staypuft /n/auspex/s41/euterpe-snapshot/euterpe/compass/baseplate 24 *
```

I have no idea if this is good, but the make appeared to run without error to generate it.

Tim

From: vanthof (vant)
Sent: Friday, July 28, 1995 10:51 PM
To: Tom Laidig [tau]
Cc: tbr (Tim B. Robinson); wampler (Kurt Wampler); geert (Geert Rosseel); tau; vanthof (Dave Van't Hof)
Subject: Re: looking for euterpe.ly

Tom Laidig [tau] writes:

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>that need to be released. The one in the snapshot doesn't seem very
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Sorry, I mis-stated what I meant to say. There is a euterpe.ly found in the search path
specified in the vlsi.boo found in that directory.

Dave

--
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089
vanthof@microunity.com 1 408 734-8100

"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just
not in this context." The Tick to Thrackazog

From: jack (Jack Wenstrand)
Sent: Friday, July 28, 1995 7:33 PM
To: manser; tbr; geert
Cc: mous; tony
Subject: Euterpe

Minutes
Euterpe meeting
7/28/95

Attending: Geert, Tim, Steve, Jack

Topic: Layout reviews for Euterpe.

Notes:

Euterpe lower levels must tape out by 9/1. The fracture flow must begin on 8/24. Thus, we have less than 4 weeks for layout adjustments.

The current Euterpe is in an intermediate state between the last set of design rules and the current one.

Many Pollux cells flow directly into Euterpe, are consistent with the current design rules, and have recently been reviewed by the fab organization.

More important areas for review include:

Clock
Bus
Register file
Cerberus
Pads

Actions:

Geert will pull in all the latest Euterpe cells and start a DRC over the weekend.

Tim will put together a prioritized list of cells for review by the fab organization, to be discussed at 2:30 on Monday.

Jack will speak with Anh and Al about Euterpe on Monday.

Steve, Geert, Tim, and Jack will meet to followup on Tuesday.

From: tbr
Sent: Friday, July 28, 1995 7:26 PM
To: tom (Tom Laidig [tau])
Cc: geert (Geert Rosseel); tau; vanthof (Dave Van't Hof); wampler (Kurt Wampler)
Subject: looking for euterpe.ly

Tom Laidig [tau] wrote (on Fri Jul 28):

I'm looking for the most up-to-date euterpe.ly to get a list of layouts that need to be released. The one in the snapshot doesn't seem very new:

61 -rw-r--r-- 1 chip caddev 62038 Apr 17 12:01 euterpe.ly

Dave said there was one in ~vanthof/compass/mobi/euterpe/tapeout, but a 'find' failed to find a file called euterpe.ly anywhere under ~vanthof/compass.

For the moment, I'm using the one in the snapshot to get my cell list. If anyone has a better one, I'll use it.

I'm going to generate a new one in the snapshot off the route kurt has just completed. I have no idea what the origin is of the one that's there now. It's not been generated automatically off the flow because the route/timing does not complete 100% without manual intervention.

Tim

From: tom (Tom Laidig [tau])
Sent: Friday, July 28, 1995 6:38 PM
To: tbr (Tim B. Robinson); wampler (Kurt Wampler); vanthof (Dave Van't Hof); geert (Geert Rosseel)
Cc: tau
Subject: looking for euterpe.ly

I'm looking for the most up-to-date euterpe.ly to get a list of layouts that need to be released. The one in the snapshot doesn't seem very new:

```
61 -rw-r--r-- 1 chip      caddev      62038 Apr 17 12:01 euterpe.ly
```

Dave said there was one in ~vanthof/compass/mobi/euterpe/tapeout, but a `find' failed to find a file called euterpe.ly anywhere under ~vanthof/compass.

For the moment, I'm using the one in the snapshot to get my cell list.
If anyone has a better one, I'll use it.

--

'_'

From: graham (Graham Y. Mostyn)
Sent: Friday, July 28, 1995 6:04 PM
To: abbot@gaea; bill@gaea; craig@mnemosyne; geert@gaea; gmo@gaea; graham@gaea;
hayes@gaea; lisar@gaea; mudge@gaea; tbr@gaea; manser@charybdis
Subject: Re: Input Please

1) Hestia

Regarding Hestia, a second revision of the main circuit board and also the bandsplit daughter board were recently received and tested.

The most significant problem on the main board - upstream transmitter stability - has been solved. The new transmit circuit layout is completely stable.

The bandsplit board has had 14 components eliminated, is much more manufacturable (through hole and surface mount components have been isolated on different sides), and the RF loss is greatly reduced to only ~ 1dB, within spec.

The boards cannot be fully debugged without Euterpe/Calliope, but in the absence of those chips, the progress of design, evaluating the first revision, and successfully correcting the major problems on this version justify recognition.

2) Cablemodem RFP

I think that the intensive effort and significant innovation on the CableLabs cablemodem RFP - and the CMAC protocol developed - deserve mention.

Graham.

```
> From manser@charybdis Wed Jul 26 19:39:25 1995
> Date: 26 Jul 1995 19:37:24 -0800
> From: "manser" <manser@charybdis>
> Subject: Input Please
> To: "abbott" <abbott@gaea>, "bill" <bill@gaea>, "craig" <craig@mnemosyne>,
>      "geert" <geert@gaea>, "gmo" <gmo@gaea>, "graham" <graham@gaea>,
>      "hayes" <hayes@gaea>, "lisar" <lisar@gaea>, "mudge" <mudge@gaea>,
>      "tbr" <tbr@gaea>
> Cc: manser@charybdis
> Content-Length: 1384
>
> As you heard today at company lunch, we will be having a
> communications meeting next Wednesday. As part of this, I'd like to
> solicit input for examples of progress to be recognized (at the team level).
>
> Here is a partial list of (near) accomplishments over the last few weeks:
>
> - working oscillators (3 level metal)
>
> - working Sisyphus CMOS and BICMOS ring oscillators
>
> - (near) clean Pollux design (this may be done by the end of this
> week)
>
> - Mnemo is currently fully routed and timing accurate. However there are
> some logic fixes which need to be completed and rerouted/timed. Again,
> this should be done prior to first Friday.
>
> - Euterpe is nearly completed. No known logic bugs, only another 40-50
> routes and timing paths need to be completed. Again, this should be
> do-able by FF.
```

> - OSF running on software simulator (not to prompt yet). This
> validates the
> compiler and OSF port.
>
> - Others...Hestia, Pandora, etc. We will need to make sure we
> don't miss any
> major milestones across the company.
>
>
> Please provide me with your feedback by Friday on two subjects:
>
> 1 Am I missing any areas (I apologize in advance)?
>
> 2 When will we know if we have 100% success for those areas where we
> are close (Unix prompt, Euterpe routes, etc.)? Alternately, we can
> always get an update on Tuesday night to finalize.
>
> Steve
>
>
>
>

From: graham (Graham Y. Mostyn)
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Subject: Re: Input Please

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> are close (Unix prompt, Euterpe routes, etc.)? Alternately, we can
> always get an update on Tuesday night to finalize.
>
> Steve
>
>
>
>

From: graham (Graham Y. Mostyn)
Sent: Friday, July 28, 1995 4:15 PM
To: craig; manser; tbr; tony; todd
Cc: graham; abbot
Subject: Minutes - Zeus marketing

Attendees: Craig Graham Tim Todd Tony Steve: 7/27/95

Todd presented a set of slides which:

- showed an example business objective for Zeus
- provided a systematic methodology for analysing and ranking application opportunities, and combining them with a value proposition
- included proposed sources of value and market positioning for Zeus, with potential application opportunities.

The following minutes should be read in conjunction with the slides, both of which will be entered on-line:

1. The business objective statement presented on the slide example was discussed. The following were also raised:

- power efficient
- a real product, not a demonstrator
- revenue is largely licensing
- company visibility and technology leadership important
- diffuse the architecture
- complementary product to Mobi equivalent and Euterpe

While Zeus will most likely represent a family of products, the implementation as a "core" is an important one, and places restrictions on die size, since the customer will wrap custom processing and I/O around it.

We need to sharpen this statement of objective further.

2. Product positioning.

Comparing Zeus to microprocessors, programmable DSPs, custom ASICs and commodity signal processors (ASSPs), we determined that Zeus offers signal processing capability over uPs, and is much easier to program than DSPs, where tools are currently poor.

3. Industry attractiveness/value proposition methodology.

Given the provisos that we should project the conditions prevalent in the industry 18 - 24 months ahead, we agreed to use the Porter methodology as an industry analysis tool, and write value propositions for selected applications.

4. Comments on platforms

There was general agreement to focus on products where our costs were comparable to ASICs, but the need to run software on the product gave us an advantage. Attractive applications were established ones of medium volume and high price.

5. Applications listing

We agreed to add "Data Switching" to those shown on our slide.

6. Action items for the next meeting:

* Tony committed to complete market sizes and growth rates for a set of presented applications; and additionally to project pricing/performance of MVPs and uPs 2 years ahead.

* Craig agreed to analyse the PC market, using our methodology.

* Participants were asked to select other preferred applications, and employ the analysis methodology.

Next meeting:

Thursday 3:30 pm August 3. Hardware Engineering Conf room

From: vanthof (vant)
Sent: Friday, July 28, 1995 1:14 AM
To: Tim B. Robinson
Cc: vanthof (Dave Van't Hof); geert (Geert Rosseel)
Subject: Re: euterpe

Tim B. Robinson writes:

>
>According to Anh, sisyphus1, pollux, sisyphus2, euterpe. She also
>wants a revised calliope, but that's out for lots of non fab reasons.

This is contrary to the statements Al made in a meeting yesterday where we hashed out the compromised design rule set. What he talked about was:

sisyphus1, sisyphus2, pollux, euterpe

>Clearly from our perspective pollux should go before euterpe, but I (and
>geert and steve manser) are all very keen to get a euterpe that has no
>known logic bugs (done), csyn clean (done), is fully routed (done),
>makes timing (will be done in a day or so), and is LVS clean.
>Then it's up to the fab to stop changing the rules. In the discussion
>I had Anh was very strongly implying that they wanted it but was also
>implying we were incapable of delivering it. I share your frustration.
>However, I think things are improving a little.

>
>Tim

Well, nothing will go out until I get the tapeout flow updated to the latest rules and Tom gets vlsimm enhanced. By that time, sisyphys2 will be ready and we already know that the current pollux has structures that Al doesn't like and wants changed.

Dave

--
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089
vanthof@microunity.com 1 408 734-8100
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just
not in this context." The Tick to Thrackazog

From: tbr
Sent: Friday, July 28, 1995 1:06 AM
To: vanthof (vant)
Cc: geert (Geert Rosseel); vanthof (Dave Van't Hof)
Subject: Re: euterpe

vant wrote (on Thu Jul 27):

Tim B. Robinson writes:

>
>
>In a discussion with anh this afternoon she indicated great eagerness
>to get a euterpe mask set to the same DRC rules as pollux. Is this
>consistent with what al is saying? Can we "go for it" while we have a
>chance?
>
>Tim
>

Bizarre. According to what I've heard, (well, one of a dozen different stories from the fab...) is that pollux will not work unless we redo the layouts to the compromised design rule set. Even that may not work and we won't know that until sisyphus2 is back. My impression from Al is that everything is keyed on the results of sisyphus2.

I hate to say this, that this whole situation is extremely frustrating. I can not get a straight answer about what chip set the fab wants to see. Is it sisyphus2? pollux, euterpe? in what order, and to what design rule set? Al claims any chip taped out to the current rules won't work, yet Ahn wants a euterpe?

Sorry, I don't have the foggiest idea where to put my efforts? I'm getting very tired of putting lots of effort into the latest hot topic only to find out much later that virtually moments later, the focus has shifted and I've wasted my time. This will be the third time that I've done the backend flow, and it won't be the last. I really need a consistent set of answers.

According to Anh, sisyphus1, pollux, sisyphus2, euterpe. She also wants a revised calliope, but that's out for lots of non fab reasons.

To answer your question. Euterpe is probably weeks away from being drawn to the 'pollux' standard. Almost all effort has gone into fixing up pollux. There are many areas which have not been looked at in euterpe. In addition, the entire pad ring is most likely still wrong and must be redone, again.

Unfortunately, we cannot 'go for it' just yet as there is probably a week or two worth of work for me to get the backend tapeout flow updated to the 'latest' set of rules that Al and supposedly Ahn wants (which by the way, changed again today...). In addition, Tom has quite a bit of work in vlsimmm just to get some mandatory enhancements in to meet the 'pollux' design rules.

I'm expecting that by the time sisyphus2 layouts are done, I'll be ready, just in time, with the tapeout flow due to constant interruptions and meetings. No other chips can tapeout until this is done.

Clearly from our perspective pollux should go before euterpe, but I (and geert and steve manser) are all very keen to get a euterpe that has no known logic bugs (done), csyn clean (done), is fully routed (done), makes timing (will be done in a day or so), and is LVS clean.

Then it's up to the fab to stop changing the rules. In the discussion I had Anh was very

strongly implying that they wanted it but was also implying we were incapable of delivering it. I share your frustration. However, I think things are improving a little.

Tim

From: vanthof (vant)
Sent: Friday, July 28, 1995 12:53 AM
To: Tim B. Robinson
Cc: vanthof (Dave Van't Hof); geert (Geert Rosseel)
Subject: Re: euterpe

Tim B. Robinson writes:

>
>
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>to get a euterpe mask set to the same DRC rules as pollux. Is this
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From: geert (Geert Rosseel)
Sent: Thursday, July 27, 1995 9:19 AM
To: pollux
Subject: pollux LVS clean

Hi,

The toplevel Pollux is LVS clean.

We will spend a couple of days fixing up DRC errors and tape out.

There are three top-level csyn problems. I will send a mail on this later.

Geert

From: wingard (Drew Wingard)
Sent: Thursday, July 27, 1995 12:48 AM
To: steve
Cc: geert; jack; manser; tbr
Subject: Re: FW: Imminent Decision: Cronus die size

Steve Brown wrote:

> Drew,
> A die this large may reduce schedule risk but it may only yield 1 good
> die per 6" TSMC wafer and 7 good die per 8" CSM wafer. How do you
> trade off the schedule risk with the low/no yield risk?
>
> Maybe Jack has newer data on yield.
>
> Thanks.

The yield risk is real, but it is not as if we're moving from a high-yield place to a low one. We always knew that this was a low-yield design in these processes. The latest decision is more a reflection of trying to avoid a 6+ month physical design exercise (that would not yield a compelling product, and which would unacceptably delay our software and system bring-up activities).

I would term this die size decision as a calculated risk. We should know whether we have any yield before we could ever have taped out the smaller design. If we get yield (or if we have functional Euterpe by then) then important work may proceed.

If we have neither working Cronus nor Euterpe, then we're in much better shape to improve our Cronus yields by jumping on then-available (more appropriate) 3.3V .5um technologies with a shrunk design that should then yield.

Note that we still wouldn't need to go through the Herculean physical design task of a "tight" Cronus. I don't think that we can afford the resources that are required to go through such an effort on a design that has so many fundamental flaws (especially power and packaging) that will forever prevent Cronus from shipping in significant volume.

That's my recollection on some of the rational behind this proposed decision. Perhaps Geert, Tim or Steve Manser would like to elaborate?

Regards,
Drew

(my original message is included below.....)

> From: Drew Wingard on Wed, Jul 26, 1995 4:12 PM
> Subject: Imminent Decision: Cronus die size
> To: cronus
>
> The currently proposed Cronus die size is 20448 x 19008 um (i.e. 3.89 cm²).
> This would give us 292 pads in the external pad ring (plus a
> large-but-not-yet-completely-specified number of internal power pads).
> The horizontal edges would each contain 76 pads, while the vertical
> edges would have 70.
>
> This size has been approved by both of our foundry partners.
>
> We plan to use this (larger-than-expected) size in order to simplify
> the physical design and thus reduce the schedule risk.
>
> This decision is scheduled to become FINAL at 5pm on Friday, July 28.
>
> Regards,
> Drew

From: lisar (Lisa Robinson)
Sent: Wednesday, July 26, 1995 10:06 PM
To: manser
Cc: abbot; bill; craig; geert; gmo; graham; hayes; lisar; mudge; tbr
Subject: Input Please

"manser" wrote (on Jul 26):

- Euterpe is nearly completed. No known logic bugs, only another 40-50 routes and timing paths need to be completed. Again, this should be do-able by FF.

I think that it should be mentioned that as part of the Euterpe tapeout requirements we did successfully run all of the software acceptance tests that were required for tapeout and that we did boot and run the MicroKernel on the gate level design. Many thanks to all of the software groups in supporting that effort.

2 When will we know if we have 100% success for those areas where we are close (Unix prompt, Euterpe routes, etc.)? Alternately, we can always get an update on Tuesday night to finalize.

Regarding the Unix prompt. We have a little development work to do in order to get to a prompt - Enhancement of some behavioral models - and we've never run a job as long as this.

My expectation is that we will have a prompt somewhere between the September and October first Fridays. (Of course we're aiming for sooner than later!) I've included an excerpt from today's software bringup meeting which illustrates the path.

Lisa R.

We had a short discussion about the progress of the shortened OSF test that is being run on the HW simulator. We believe that the run may have been interrupted by the shutdown of the file servers yesterday. We do believe that the test has progressed beyond the point at which it stopped last time due to a problem with snoopy and an errant reference to a cerberus register (hostio).

Once this test has run, the following steps have been accomplished.

- o kernel data structure have been initialized
- o the 'probe' steps have been faked out.
- o all kernel memory is setup
 - dynamic pages for text
 - buffer caches

The above steps are estimated to take about 30 milliseconds wall clock time.

What remains to get us to a single user prompt?

- o mach_init
- o init
- o exec of a shell

The total wall clock time estimate to do the entire boot and arrive at a single user prompt is about 150 milliseconds (not accounting for disk I/O).

Given these estimates we believe that the time required to run the OSF kernel on the HW simulator (using the IKOS and including support for snoopy/sdram hostio support) will take about 150 hours.

From: manser [manser@charybdis]
Sent: Wednesday, July 26, 1995 10:37 PM
To: abbott; bill; craig; geert; gmo; graham; hayes; lisar; mudge; tbr
Cc: manser@charybdis
Subject: Input Please

As you heard today at company lunch, we will be having a communications meeting next Wednesday. As part of this, I'd like to solicit input for examples of progress to be recognized (at the team level).

Here is a partial list of (near) accomplishments over the last few weeks:

- working oscillators (3 level metal)
- working Sisyphus CMOS and BICMOS ring oscillators
- (near) clean Pollux design (this may be done by the end of this week)
- Mnemo is currently fully routed and timing accurate. However there are some logic fixes which need to be completed and rerouted/timed. Again, this should be done prior to first Friday.
- Euterpe is nearly completed. No known logic bugs, only another 40-50 routes and timing paths need to be completed. Again, this should be do-able by FF.
- OSF running on software simulator (not to prompt yet). This validates the compiler and OSF port.
- Others...Hestia, Pandora, etc. We will need to make sure we don't miss any major milestones across the company.

Please provide me with your feedback by Friday on two subjects:

1 Am I missing any areas (I apologize in advance)?

2 When will we know if we have 100% success for those areas where we are close (Unix prompt, Euterpe routes, etc.)? Alternately, we can always get an update on Tuesday night to finalize.

Steve

From: Mark Semmelmeyer [mws@gaea.microunity.com]
Sent: Wednesday, July 26, 1995 9:17 PM
To: guarino@microunity.com; hayes@microunity.com
Cc: compiler@microunity.com; craig@microunity.com; abbott@microunity.com;
gmo@microunity.com; gregg@microunity.com; mws@microunity.com
Subject: Re: another microarchitecture gotcha

> From hayes@microunity.com Wed Jul 26 17:54:35 1995

> Guarino wrote:

> > At today's bring-up meeting, we were discussing the fact that branch
> > prediction doesn't predict if the branch crosses a page boundary.
[snip]

>

> Thanks. I asked Ethan about loop-dee-doop...

I hope your reference to loop-dee-doop has to do
with uncached ifetches or icache fills; it has nothing
to do with page crossing branches or sequential page crossers.

> [snip] Of course, this means we'll either need an
> asm-level nop (Mark has several in the opcode table, but none
> are architecturally visible)

You must have an old table or our using the TSA. Euterpe and cronus
support the ENOOP instruction at major opcode 0xDD. You should not
be seeing "several".

> There's
> nothing the compiler can do about a loop bigger than the page size,
> so the application developers need to beware.
...although then the cost can be amortized over a larger chunk.

> BTW, what's the branch penalty these days? 3 cycles?
It is still 3 (not including counting 1 for executing the
branch itself).

From: Derek Iverson [doj]
Sent: Wednesday, July 26, 1995 7:53 PM
To: pandora; hestia
Subject: Software Bringup Meeting Minutes - July 26, 1995

We had a short discussion about the progress of the shortened OSF test that is being run on the HW simulator. We believe that the run may have been interrupted by the shutdown of the file servers yesterday. We do believe that the test has progressed beyond the point at which it stopped last time due to a problem with snoopy and an errant reference to a cerberus register (hostio).

Once this test has run, the following steps have been accomplished.

- o kernel data structure have been initialized
- o the 'probe' steps have been faked out.
- o all kernel memory is setup
 - dynamic pages for text
 - buffer caches

The above steps are estimated to take about 30 milliseconds wall clock time.

What remains to get us to a single user prompt?

- o mach_init
- o init
- o exec of a shell

The total wall clock time estimate to do the entire boot and arrive at a single user prompt is about 150 milliseconds (not accounting for disk I/O).

Given these estimates we believe that the time required to run the OSF kernel on the HW simulator (using the IKOS and including support for snoopy/sdram hostio support) will take about 150 hours.

Next we talked about the SW/HW simulation accuracy project. Ethan has been able to modify terp so that all three of the items Jeffm identified as introducing time differences have been resolved. There is still a difference of about 70 minor cycles that still need to be identified.

It may be crucial to have the capability to ensure that performance critical code sections do not cross page boundaries (and invalidate predicate branches).

Gmo is going to ensure that code in the micro kernel does not exhibit this behavior.

Loretta is going to investigate the ability for C code to request/ensure proper alignment of code segments within a page.

Wally reports that the remote debugging environment for euterpe basically works. He has been able to simulator break points, single stepping, displaying variables and registers, etc. Wally would like to do some addition work to allow attach/detach capability, support a better method of interrupting the euterpe cylinders, and fix a problem related to printing variables that have been modified by a previous gdb command.

Wally would like to be given a name of a test that he can use to test the loading and running capability. Jeffm suggested that we use drameasy for this purpose.

Ethan reported that he has implemented almost all outstanding 'above the bar' requests for SW simulator.

We want to get performance results for ifetch via the hermes channel. Tim will begin writing a test to measure this.

Tim has released a new icache_perf test and Loretta has released a new performance test in the stb/stand/diag area called gtlb_perf.

A list of architectural differences between euterpe and cronus is needed so that appropriate support in the SW simulator and diagnostics can be added. Jeffm has volunteered to pester tbr.

We would like to make sure the the TCC compiled acceptance tests get run on the HW simulator. Lisar was not available for today's meeting and we are sure she could have filled us in on the progress of this item.

That is all folks.

From: graham (Graham Y. Mostyn)
Sent: Wednesday, July 26, 1995 5:09 PM
To: mudge
Cc: tbr@gaea; geert; manser; rich
Subject: Re: S2 resource meeting

I consider Sisyphus, Pollux and Castor all playing vital but different roles in helping to bring up the fab. When we've all agreed on the relative tapeout priorities, my interest would be in adding design resource to this third chip, as well, to help speed completion. In the meantime, Rich McCauley and I would be interested in joining you on the Castor sessions.

Regards, Graham.

> From mudge Wed Jul 26 14:43:50 1995
> Date: Wed, 26 Jul 1995 14:43:46 -0700
> From: mudge (john mudge)
> To: graham
> Subject: Re: S2 resource meeting
> Cc: tbr@gaea, geert, manser, mudge
> Content-Length: 1299
>
> Graham,
> Chris, Tom Ho, Paul and myself have set up regular working meetings to
> design, layout and track castor 2. These got interrupted by sisyphus
> 1 and now will be interrupted by sisyphus 2. Castor 2 is basically an
> update to the new rules of castor 1 and there are some analog related
> structures on castor 1 so input from the analog design team could be
> helpful. What did you have in mind? If you want to join the meetings or send a
representative, let me know.
>
> johnnymudge
> _____

From: graham (Graham Y. Mostyn)
Sent: Tuesday, July 25, 1995 6:21 PM
To: geert@gaea; graham@gaea; mudge@gaea; manser@charybdis
Cc: tbr@gaea
Subject: Re: S2 resource meeting

In this same vein of assisting the fab, I'd like to receive more visibility on Castor, and how the design team can help there too.

Castor, which is more structure and less circuit-oriented than Pollux/Sisyphus, seems indispensable to me for the fab to pursue device diagnosis and design rule changes.

I would propose a separate but related meeting to ensure there are no open issues (such as resource and tapeout schedule) for this chip too.

Graham.

From: Tom Eich [tbe@microunity.com]
Sent: Monday, July 24, 1995 7:22 PM
To: jack; geert; hchu; bill; tbr; pmayer; trancy
Cc: cronus; pandora; wingard
Subject: Results of Cronus mounting and pcb design meeting

The following are actions and results from the meeting held 7/24 relative to Cronus mounting, de-coupling, and pcb design.

- 1) No metal on the back of the die or the Micro Module space transformer.
- 2) Thickness of die: It is strongly desired to have one die thickness and tolerance, regardless of sourcing, else we have to have n different parts given n different thicknesses. This would also apply to the spacer and the assembly.

a) Jack to determine standards and options for TSMC and CSM. Done:

Jack wrote:

>Herman,
>
>Both TSMC and CSM back-grind to 19 mils or 480 microns final wafer
>thickness.
>
>TSMC's tolerance is +/- 1 mil; CSM is checking.
>
>Both vendors are investigating whether or not they can back-grind to
>Euterpe's 25 mil thickness.
>
-- Jack

- b) Jack to determine standard flatness and finish for both vendors or get technical contact for same in touch with Herman.
- c) Trancy to provide dimension and tolerance for bump/seal ring for Cronus with MMS s/t.
- 3) Pattie to get snapshot of Cronus pad assignments and place rats nest with maximum 0805 caps on bottom side for Bill et al to review.
- 4) Tbr to ensure that pcb design criteria is considered in final Cronus pad assignments.

Please follow up with any corrections or closure here.

Regards,

-Tom

Tom Eich
MicroUnity Systems Engineering, Inc.
255 Caspian Dr. Sunnyvale, CA 94089
(408) 734-8100, (408) 734-8177 fax

tbe@microunity.com

Any opinions expressed
above are mine

From: manser [manser@charybdis]
Sent: Monday, July 24, 1995 4:10 PM
To: bill; craig; geert; gmo; graham; gregg; hayes; lisar; mudge; tbr; wingard
Cc: abbott; jack; manser@charybdis; mouss@charybdis
Subject: 1st Zeus Meeting

Here are the notes and actions from the first CMOS (code name: Zeus) microprocessor discussion. Preliminary feature set:

- TSMC 0.5
- size = 1/2 reticle
- Speed/Power
 - Cable Modem @ 10W
 - Hestia @ 40W
- Schedule
 - Tapeout Q4 96
 - Sample 1H 97
 - Production 2H97

Review of features raised the following (types of) questions:

- How much support for X86 should be in hardware/software and how important is the performance level vs Intel?
- Need to better understand performance variations between multiple threads and multiple issue.
- Need more data on industry profile on technology - is 0.5 TSMC aggressive enough? Need inventory of foundries for technology vs time.
- Need to better understand metal systems and implication on Zeus design.
- What packaging assumptions should be assumed for low cost/power?
- Need to understand transistor size for random logic and memory vs Zeus.
- If the goal is to make this a PORTABLE core, we should insure that the processor is very modular and can have other logic easily added.

More data is needed to converge on a small subset of discussions. It was agreed that, to move quickly, there would be three separate teams which will investigate major topic areas in parallel and return their findings (and proposals) back to the larger forum. These teams are as follows.

Technology Group -

Goal: Survey the landscape, gather info, make assumptions, and make proposals on technology issues related to Zeus.

Team leader: Bill

Team members: Bill, Johnny, Geert, Drew, Craig

Preliminary issues: packaging, metals, transistors, die size, industry direction and vendor base.

Architecture Group -

Goal: Synthesize existing performance data with new X86 goals and make proposals on alternative architectural implementations.

Team leader: Craig

Team members: Drew, Geert, Tim, Lisa, Gregg, Gmo, Ray

Preliminary issues: current performance and instruction traces, cycle efficiency, X86 instruction support, compiler modifications.

Marketing Group -

Goal: Working with Marketing (ie Tony) strive to better define Zeus feature,

cost, schedule tradeoffs.

Team leader: Graham

Team members: Craig, Steve, Tim, (Tony)

Preliminary issues: features, cost target, etc.

Team leaders should have the responsibility of calling meetings, summarizing meeting minutes and actions and summarizing discussions to the larger forum. Also, While new architecture's are always more interesting, Steve asks that we make sure that we keep a balanced approach to insure that the investigatory work does not impact Euterpe, Cronus, and TCI RFP related activities.

Next meeting is scheduled for Friday the 28th from 1-2 in the War Room. I would ask that team leaders have a 1 page summary of progress.

From: Hieu Tran, Acct Mgr, CSMSJ [tran@csminc.com]
Sent: Monday, July 24, 1995 1:22 PM
To: jack
Cc: dobrush; geert; tbr; wampler; wingard; wong
Subject: RE: Prototype chip die size

Hello Jack,
This die size is fine for ASM reticle field. Please update the tape out schedule if you have a chance.

Regards,
Hieu

From: jack
To: tran
Cc: dobrush; wong; wingard; geert; tbr; wampler; jack
Subject: Prototype chip die size
Date: Monday, July 24, 1995 10:41AM

Hieu,

The currently proposed die size for our prototype run is 20448 x 19008 um (i.e. 3.89 cm^2).

Please confirm that this will be acceptable.

Regards,
Jack

Jack Wenstrand Tel: (408) 734-8100
MicroUnity Systems Engineering, Inc. Fax: (408) 734-8141
255 Caspian Drive
Sunnyvale, CA 94089-1015 email: jack@microunity.com

From: graham (Graham Y. Mostyn)
Sent: Monday, July 24, 1995 11:29 AM
To: geert@charybdis; graham@gaea; hopper@gaea; lisar@gaea; tbr@gaea; manser@charybdis
Subject: RE: more on "Progress towards Products"

3 - 3.30 will be fine for me. I agree that it's really important for us to recognize our accomplishments.

Graham.

> From manser@charybdis Sat Jul 22 12:57:41 1995
> Date: 22 Jul 1995 12:56:21 -0800
> From: "manser" <manser@charybdis>
> Subject: RE: more on "Progress towards Products"
> To: "Geert Rosseel" <geert@charybdis>, "graham" <graham@gaea>,
> "hopper" <hopper@gaea>, "lisar" <lisar@gaea>, "tbr" <tbr@gaea>
> Content-Length: 1952
>
> Just noticed I have a 10-11 Cronus meeting...so how about 3-3:30 instead?
>
>
> From: Geert Rosseel on Sat, Jul 22, 1995 12:02 PM
> Subject: more on "Progress towards Products"
> To: graham; hopper; lisar; manser; tbr
> Cc: mouss
>
>
>
>
> Hi,
>
>
> A couple of things happened this week that made me think about the
>> sending this mail.
>
> 1. We celebrated lots of working ringoscillators
> 2. Tom Vo finished a 926 ps Mnemosyne (Mnemo
> still needs some verification, but what
> Tom and Alan and other people have done is
> a big achievement)
> 3. Tim got very close a 1GHz Euterpe.
>
> I realized that actually what we have today, barring DRC changes, is
>
> -> "close to a 1 GHz" Euterpe
> -> a 926 ps Mnemosyne (well, it misses timing with .36ps) -> a
>> Pollux
>
> If we didn't have design rules changes, we could tape all these out
>> in a very short amount of time. I was wondering if somehow we could
>> decouple recognizing the fact that we finished these designs from the
>> actual "tape-out" which is very fab-dependent (and might take a while
>> from now).
>
> I think, under the current circumstances, from the design
>> perspective, we can consider a design done when we have an LVS clean,
>> logically verified database.
>
> It seems very fair to me to make the statement that we've finished
>> these designs and we only have the rev the layouts to the new DRC
>> rules and tape them out. ("only" is a bit of an understatement, but
>> still true compared to the massive amount of work that already has

> gone in these designs)
>
> So, it seems to me it might be good to give some company wide
> visibility to the fact that we have "finished" the above designs, once
> we all agree that we have LVS clean fully verified databases. When
> all three designs are "done", we could have some announcement at a
> First Friday Meeting or Wednesday lunch or something ...
>
>
>
>
>
>

Geert

From: solo (John Campbell)
Sent: Monday, July 24, 1995 9:45 AM
To: lisar (Lisa Robinson)
Cc: vanthof (Dave Van't Hof); tau; hopper (Mark Hofmann); geert (Geert Rosseel); tbr (Tim B. Robinson); agc (Alan Corny)
Subject: we got one (fwd)

as Tim B. Robinson was saying

.. It's also csyn clean .

.. Pending results of other verification , we're ready for the
.. tapeout process .

.. Well done all!

.. Tim

sounds like we should turn on the mnemo verification of drc lvs for its custom blocks.
starts again tonight.

....
regards,
solo a.k.a. John Campbell x516

From: lisar (Lisa Robinson)
Sent: Saturday, July 22, 1995 11:38 PM
To: tbr
Subject: Mnemo PCI status

----- Begin Included Message -----

>From deepak Sat Jul 22 18:49:13 1995
Return-Path: <deepak>
Received: from ast.microunity.com by gaea.microunity.com (4.1/muse1.3)
id AA22556; Sat, 22 Jul 95 18:49:06 PDT
Received: from localhost by ast.microunity.com (8.6.4/muse-sw.3)
id SAA25923; Sat, 22 Jul 1995 18:49:05 -0700
Date: Sat, 22 Jul 1995 18:49:05 -0700
From: deepak (Deepak Tripathi)
Message-Id: <199507230149.SAA25923@ast.microunity.com>
To: deepak, lisar
Subject: Mnemo PCI status
Content-Length: 12200
X-Lines: 184
Status: RO

Lisa,

The checked in mnemo database (which is now tapeout ready) still has a few bugs. They can be classified as follows:

NOTE: For all these tests, the LMC modules respond in 32bit mode only

1> PCI Retry mechanism:

These bugs are essentially related to the "retry mechanism" as tested by the tests ms7 & ms9. I had put in a fix for this earlier but it turned out to be incomplete because for some corner cases with 64bit v/s 32bit datasizes.

There turned out to be another bug related with the handshaking between the pci modules and the rest of mnemo. The data read in on a re-tried "PCI Read" cycle wasn't pushed back to the sram buffer.

Both of these are now fixed.

2> DMA controller bug:

All the above retry bugs also fall in this category (i.e, the retry mechanism broke down when mnemo was executing a dma command).

The other bugs are related to 64bit v/s 32bit datasizes. The pci cycle terminated incorrectly if the dma stream had to terminate after transferring only half an octlet from the last octlet (only the lower 32bits of the last octlet word). This one is fixed.

But there is as yet an unfixed one, if only one octlet has to be transferred using a dma write command, then mnemo splits the transaction into two 32bit pci cycles (whereas for reads, it fetches both 32bit words in a single transaction). Analysis pending on this.

3> Hermes Packet arrival time related bugs.

Again this has to do with mnemo in the dma mode. If the Hermes command packets come in too close to each other, the dmacontroller can get really confused. (look at comments for ms7 & ms9). I was able to get ms7 to pass by inserting more idle packets into the stream).

I haven't seen a similar failure with the PIO mechanism, since PIO transactions are a lot shorter than DMA and therefore the window (if one exists) of failure might be a lot shorter. (also it's a lot more

fun breaking the dma controller :-)

In the table below the following caveat applies:
The entire Target suite and tests ms13, ms15 & ms16 (of the master suite)
haven't been run with all the new fixes yet. These were passing earlier
and I haven't touched any of the arbiter or target modules but I still have
to make sure I haven't broken anything.

From the testing point of view, there's essentially a lot still left to do.
The entire suite below has to be run in the pure 64bit mode. If that runs
fine, then by induction, Clio should have very few problems (as all the
64bit v/s 32bit logic is being clipped out of Clio pci).

PCI Compliance Suite

Test	Status	Comments
Master scenario 1 Master Abort cycles	Pass	Need to stop mncheck from tripping over legit. error response packets.
Master scenario 2 Target Abort cycles	Pass	Squeeze out idle time in betw. transactions.
Master scenario 3 Target Retry cycles	Pass	Everything looks fine.
Master scenario 4 Single Data disconnect	Pass	Everything OK.
Master scenario 5	Not applicable	Deleted from suite.
Master scenario 6 Multi-Data phase Target abort cycles	pass	Test passes. (only for memory and config cycles) Have to include mem_rd_mul, mem_rd_line & mem_wr_inv.
Master scenario 7 Multi-Data phase Retry cycles	pass (almost)	Discovered corner case related to Hermes pkt. arrival time. Analysis incomplete but test passes when more idle packets are added inbetween command packets
Master scenario 8	Not applicable	Deleted from suite.
Master scenario 9 Multi-Data Phase Disconnect Cycles	pass (almost)	Same comment as for ms7
Master scenario 10 Multi-Data Phase & TRDY# Cycles	pass	All O.K.
Master scenario 11	pass	All O.K.

Data Parity Error Single Cycles		
Master scenario 12 Data Parity Error Multi-Data Phase Cycles	pass	All O.K.
Master scenario 13 Bus Master Timeout	pass	Timeout inefficient. Non-pci modules cannot back up fast enough.
Master scenario 14 Target Lock	Not applicable	Not applicable. Mnemo does not support LOCK accesses.
Master scenario 15 Bus Master Parking	Pass	Bus Parking test. Also covered by other tests.
Master scenario 16 Bus Master Arbitration	Pass	Mnemo can generate a transaction w/ GNT active for 1 clk only.
Target scenario 1 interrupt cycle	Not applicable	Not applicable. Mnemo will respond to intr.ack cycles
Target scenario 2 special cycle	Pass.	Mnemo does not respond to Special cycles.
Target scenario 3 address and data parity error for special cycle	Pass.	SERR asserted as expected. Config bits controlling SERR checked out.
Target scenario 4 I/O cycles with legal & illegal byte enables	Pass	Mnemo does not have to check for illegal AD/BE combinations on IO cycles.
Target scenario 5 reserved commands	Pass	Mnemo does not respond to resv. commands.
Target scenario 6 configuration cycles	Pass	Mnemo does not respond to config cycles with AD[1:0] != '00
Target scenario 7 I/O cycles with address & data parity errors	Pass	SERR and PERR asserted but no corr. Hermes error packets. OK for mnemo as target.
Target scenario 8 config. cycles w/ addr & data parity errors	pass	Mnemo asserts PERR and SERR correctly on data & addr. parity errors resp.
Target scenario 9 memory cycles	pass	Mnemo signals a disconnect for accesses that cross-over defined boundary.
Target scenario 10 memory cycles w/ addr. & data parity errors	Pass	Passes the compliance requirements. Adding addl. cycles to verify config. space status register.
Target scenario 11 fast back to back	Not applicable	Not applicable. Mnemo does not support fast back-to-

cycles		back cycles.
Target scenario 12 exclusive access cycles	Not applicable	Not applicable. Mnemo does not support lock cycles.
Target scenario 13 cycles with irdy used for data stepping	pass	passes the compliance requirements.

----- End Included Message -----

From: tbr
Sent: Saturday, July 22, 1995 4:27 PM
To: hopper (Mark Hofmann)
Subject: RE: more on "Progress towards Products"

Mark Hofmann wrote (on Sat Jul 22):

Tim B. Robinson writes:

"manser" wrote (on Jul 22):

Just noticed I have a 10-11 Cronus meeting...so how about 3-3:30 instead?

Sounds good to me. BTW, one more euterpe route iteration just completed and it's down to 54 paths failing. I'll get another turn in before the meeting . . .

Tim

I'm in agreement with Geert's perspective on this.

The 3-3:30 slot is fine for me.

Tim- that's even better news on Euterpe. Whatever you're doing, it sounds like you've perfected the recipe!

Well, there is one point of imperfection. At each iteration I typically have to manually adjust placemets of about 3 or 4 cells. Is there was some way of having them automatically adjusted to fit, then it would be possible to just let it iterate ad nauseam same as we do for the subblocks till we get a good solution. However, since I am makint the strength, pim and netcap files source files, it's not too bad because all the history is preserved if you check out a clean copy and build it. It's like you start off witht hebenefit of 5 iterations, so I'd say it's not worthe any big new effort at this point.

I think a day or so for kurt and tom vo's time ought to be able to polish this one off to no violations. My next turn should be out tomorrow, and on the present trajectory I'm expecting ~20 errors.

Tim

From: hopper (Mark Hofmann)
Sent: Saturday, July 22, 1995 9:10 AM
To: Tim B. Robinson
Cc: manser@charybdis; geert@charybdis; graham@gaea; hopper@gaea; lisar@gaea
Subject: RE: more on "Progress towards Products"

Tim B. Robinson writes:

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-hopper

From: manser [manser@charybdis]
Sent: Saturday, July 22, 1995 4:21 PM
To: Tim B. Robinson; Tom Vo
Cc: Alan Corry; Dave Van't Hof; Geert Rosseel; Kurt Wampler; Lisa Robinson;
manser@charybdis; Mark Hofmann; mnemo@charybdis; mouss@charybdis; Richard
Dickson; tau@charybdis
Subject: RE: we got one

Hey guys - this is great news! With the progress over the last few days/weeks, you should all feel proud of what you are accomplishing. While we are not yet finished, you are making excellent progress! Keep it up!!

Steve

From: Tim B. Robinson on Fri, Jul 21, 1995 10:10 PM
Subject: we got one
To: Tom Vo
Cc: Alan Corry; mnemo; manser; mouss; Richard Dickson; Geert Rosseel; Mark Hofmann; Lisa Robinson; tau; Dave Van't Hof; Kurt Wampler

Tom Vo wrote (on Fri Jul 21):

The latest and greatest mnemo is now fully routed and timed at 926.38ps according to topt .

Rat's you beat me! Hey this is fantastic - I'll allow you that 0.38 of a picosecond!

It's also csyn clean .

Pending results of other verification , we're ready for the tapeout process .

Well done all!

Tim

From: geert (Geert Rosseel)
Sent: Saturday, July 22, 1995 2:02 PM
To: graham; hopper; lisar; manser; tbr
Cc: mous
Subject: more on "Progress towards Products"

Hi,

A couple of things happened this week that made me think about the sending this mail.

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Geert

From: tbr (Tim B. Robinson)
Sent: Saturday, July 22, 1995 12:10 AM
To: vo (Tom Vo)
Cc: agc (Alan Corry); mnemo; manser; mous; dickson (Richard Dickson); geert (Geert Rosseel); hopper (Mark Hofmann); lisar (Lisa Robinson); tau; vanthof (Dave Van't Hof); wampler (Kurt Wampler)
Subject: we got one

Tom Vo wrote (on Fri Jul 21):

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Rat's you beat me! Hey this is fantastic - I'll allow you that 0.38 of a picosecond!

It's also csyn clean .

Pending results of other verification , we're ready for the tapeout process .

Well done all!

Tim

From: tbr
Sent: Saturday, July 22, 1995 12:10 AM
To: vo (Tom Vo)
Cc: agc (Alan Corry); mnemo; manser; mous; dickson (Richard Dickson); geert (Geert Rosseel); hopper (Mark Hofmann); lisar (Lisa Robinson); tau; vanthof (Dave Van't Hof); wampler (Kurt Wampler)
Subject: we got one

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Well done all!

Tim

From: vo (Tom Vo)
Sent: Friday, July 21, 1995 7:18 PM
To: lisar (Lisa Robinson); tbr (Tim B. Robinson); agc (Alan Corry); dickson (Richard Dickson); geert (Geert Rosseel); hopper (Mark Hofmann); tau; wampler (Kurt Wampler); vanthof (Dave Van't Hof)
Subject: we got one

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It's also csyn clean .

Pending results of other verification , we're ready for the tapeout process .

tvo

From: trancy [trancy@charybdis]
Sent: Thursday, July 20, 1995 9:44 PM
To: Tom Eich
Cc: bill; geert; Herman Chu; pmayer; Tim B. Robinson; wingard
Subject: RE: Cronus pcb layout and mechanical mounting

Hi Tom,

Let's meet next Monday because I have to attend a Workshop tomorrow.

Regards.
Trancy.

From: Tom Eich on Thu, Jul 20, 1995 6:12 PM
Subject: Cronus pcb layout and mechanical mounting
To: trancy; pmayer; bill; tbr; hchu
Cc: geert; wingard

I am anticipating a problem with the cronus pcb assembly design. Specifically, the decision to go to a 70mm TAB frame calls into question the use of the existing heatsink clamp and spacer (developed for Calliope and Euterpe on Hestia). This is because of the constraints placed on pcb layout around Cronus on both the top and bottom side of the pcb.

The problem is one of extremely limited bottom side pcb area due to the combination of the keepout for the TAB tooling and the keepout for the current clamp, and limited top side pcb area due to the combination of the heat sink spacer and the 70mm TAB pattern. I need your help to sort out the options and would therefore like to meet to review the problem. Can we do this on Friday, at 4:00pm in the boxers conference room?

Thanks,

-Tom

Tom Eich
MicroUnity Systems Engineering, Inc.
255 Caspian Dr. Sunnyvale, CA 94089
(408)734-8100, (408)734-8177 fax

tbe@microunity.com

Any opinions expressed
above are mine

From: Tom Eich [tbe@microunity.com]
Sent: Thursday, July 20, 1995 8:11 PM
To: trancy; pmayer; bill; tbr; hchu
Cc: geert; wingard
Subject: Cronus pcb layout and mechanical mounting

I am anticipating a problem with the cronus pcb assembly design. Specifically, the decision to go to a 70mm TAB frame calls into question the use of the existing heatsink clamp and spacer (developed for Calliope and Euterpe on Hestia). This is because of the constraints placed on pcb layout around Cronus on both the top and bottom side of the pcb.

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From: vanthof (vant)
Sent: Thursday, July 20, 1995 1:04 AM
To: Tim B. Robinson
Cc: wingard (Drew Wingard); bobm (Bob Morgan); craig (Craig Hansen); cronus; dickson (Richard Dickson); vanthof (Dave Van't Hof)
Subject: Re: cronus cerberus registers 0-5

Tim B. Robinson writes:

>
>Then we had better amend the schedule to reflect this fact. As far as
>I was aware we had adopted a subset of the design rules to be
>compatible with both and I don't think the schedule has ever shown two.
>With the current methodology, it's much more than the drc that would
>get duplicated since we would have to have two different routes, two
>different LVS runs and two different logic regression passes.
>
>It remains the case that anything we are required to do which will slow
>down either tapeout is a bad thing.
>
>For future designs we clearly need a different approach to the way
>these registers get personalized so as to avoid a hit like this.
>
>Tim
>

Tim is correct. If we really want different registers in the various foundry specific chips, then we will need a source for each foundry. The current methodology for drc/lvs/tapeout is to have only one source and the variations would be implemented at layout verification and fracture times in the drc and tapeout flows. This allows us to parallelize the tapeouts to each foundry.

Dave
--
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089
vanthof@microunity.com 1 408 734-8100
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just
not in this context." The Tick to Thrackazog

From: tbr (Tim B. Robinson)
Sent: Thursday, July 20, 1995 12:53 AM
To: wingard (Drew Wingard)
Cc: bobm; craig; cronus; dickson
Subject: Re: cronus cerberus regiters 0-5

Drew Wingard wrote (on Wed Jul 19):

Tbr wrote:
> Craig Hansen wrote (on Wed Jul 19):
>
> <snip>
>
> With the above information, I would use just a new manufacturer
> code, which shall be (drum roll please) 0x00 40 a3 b4 ed fe.
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> So octlet 2 changes from 0x00 40 a3 69 db 3f 01 00
> to 0x00 40 a3 b4 ed fe 01 00.
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> The manufacturer code should be distinct for each Cronos vendor,
> to facilitate tracking, so if we are taping out to >1 vendor,
> I'll assign some additional codes.
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> That presents us with an additional challenge. My understanding is
> the current plan is to tape out identical masks to the two vendors
> (geert can you comment on this please). Although it would logically be
> a trivial change to have this number different between the two and a
> valuable feature to help track things after fab and packaging, having
> to handle two independent tapeouts may add an unacceptable delay to one
> of them, at least for the first version. We are assigning two
> different part numbers because there are physical differences (such as
> wafer thickness) which affect the packaging.
>
> Tim

We can't tape out *identical* masks to our two foundries for a couple of reasons:

1. Different design rules
2. Different layer names
3. Different layer biases/fields

We'll need to at least have separate fracturing flows. I would claim that we really have two tapeouts. Since we know which vendor has better turnaround time (and better yield), I think that we know which one to tapeout first.

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Sent: Thursday, July 20, 1995 12:53 AM
To: wingard (Drew Wingard)
Cc: bobm; craig; cronus; dickson
Subject: Re: cronus cerberus registers 0-5

Drew Wingard wrote (on Wed Jul 19):

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For future designes we clearly need a different approach to the way these registers get personalized so as to avoid a hit like this.

Tim

From: wampler (Kurt Wampler)
Sent: Wednesday, July 19, 1995 11:13 PM
To: lisar; wingard
Cc: bobm; craig; cronus; dickson; tbr; vanthof
Subject: Re: cronus cerberus regiters 0-5

Drew writes:

> We can't tape out *identical* masks to our two foundries for a couple
> of
> reasons:
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> 2. Different layer names
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> We'll need to at least have separate fracturing flows. I would claim
> that we really have two tapeouts. Since we know which vendor has
> better turnaround time (and better yield), I think that we know which one to tapeout
first.

Lisa R. replies:

@Uhmm, I agree with Tbr that given the way we tapeout today, a separate @tapeout (ie some logical difference) would represent a delay for one.
@maintaining a snapshot database is not a trivial task, double the @LVS/DRC/Functional verification is not represented in the schedule (In @fact thinking about it the best way to accomplish this would be to @serialize the process and avoid taking a branch!).
@

@My understanding was that the DRC flow was a superset of the 2 flows @and thus final DRC would be done once and that differences associated @with the 2 vendors would be entirely at the back end.

In our layout methodology, as I understand it, we generate one set of layout files that are not strictly legal for either foundry. At tapeout time, a certain amount of synthesis is performed to render the layout compliant with the target foundry's layout rules. These synthesis steps are part of the DRC flow, but are different for the two target foundries, so the DRC flows are different. (Dave Van't Hof can correct me if I'm mis-stating the methodology here.)

As part of the DRC/Synthesis flow, we will also perform foundry-specific biases, tone inversions, and then create pattern files for each of the foundries.

I believe we intend to assign separate "device numbers" to the two versions of Cronus from the two foundries, so that wafers, dice, etc. are still traceable to which foundry they came from. These device numbers, right now, are separate from, and unrelated to the part numbers used for board-level parts lists. (Ultimately these would be linked together in some sort of database.)

It might be advantageous to have the I.D. register be different between the two different foundry versions of Cronus, but it's probably not necessary if we mark the packaged parts with an external code that allows us to distinguish which foundry they came from.

- Kurt

From: lisar (Lisa Robinson)
Sent: Wednesday, July 19, 1995 10:54 PM
To: wingard (Drew Wingard)
Cc: bobm; craig; cronus; dickson; tbr
Subject: Re: cronus cerberus registers 0-5

Drew Wingard wrote (on Wed Jul 19):

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Regards,
Drew

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Lisa R.

From: wingard (Drew Wingard)
Sent: Wednesday, July 19, 1995 9:11 PM
To: tbr
Cc: bobm; craig; cronus; dickson
Subject: Re: cronus cerberus registers 0-5

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Regards,
Drew

From: tbr (Tim B. Robinson)
Sent: Wednesday, July 19, 1995 8:33 PM
To: craig (Craig Hansen)
Cc: bobm; cronus; dickson
Subject: Re: cronus cerberus regiters 0-5

Craig Hansen wrote (on Wed Jul 19):

```
> From dickson Tue Jul 18 12:04:25 1995
> Return-Path: <dickson>
> Received: from gamorra.microunity.com by mnemosyne.microunity.com (8.6.10/muse-sw.3)
>           id MAA05939; Tue, 18 Jul 1995 12:04:24 -0700
> Received: by gamorra.microunity.com (8.6.10/muse-sw.3)
>           id MAA27963; Tue, 18 Jul 1995 12:04:23 -0700
> Date: Tue, 18 Jul 1995 12:04:23 -0700
> From: dickson (Richard Dickson)
> Message-Id: <199507181904.MAA27963@gamorra.microunity.com>
> To: craig
> Subject: cronus cerberus regiters 0-5
> Status: RO
>
> craig
>
> What's the current level of compatibility between cronus and euterpe?
>
> we're mapping euterpe directly with the exception of 'knob stuff'
> so i dont think anything at the micro-arch level is different
>
> it should be a cmos copy of the ecl euterpe design.
>
>
>                               dickson
>
```

With the above information, I would use just a new manufacturer code, which shall be (drum roll please) 0x00 40 a3 b4 ed fe.

So octlet 2 changes from 0x00 40 a3 69 db 3f 01 00
to 0x00 40 a3 b4 ed fe 01 00.

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Tim

From: tbr
Sent: Tuesday, July 18, 1995 12:40 AM
To: Tom Eich
Subject: 5V not required for Cronus in Pandora?

Tom Eich wrote (on Mon Jul 17):

I'm just sending this to you as I'm fuzzy on the firmness of our commitment to using a 3.3V process for Cronus, and therefore our elimination of the 5V bus on the bus bar (we already have the extra two contacts on the Elcon connector on each Hermes module--should we revisit that?). Please let me know what the direction is here, and if you think we need to make a "decision" message relative to the power subsystem.

5V is required. The initial tapeout is to TSMC and CSM in each case to a 0.6u 5V process. The part should also be operational on 3.3V, at reduced speed/power, but we do not want to operate in that mode in Pandora. We have also discussed a followup version to a 0.5u process which would be 3.3V only, but we have no serious plan in place for that and my guess is that the resources will go into a completely new design rather than a redesign of Cronus.

Tim

From: jack (Jack Wenstrand)
Sent: Monday, July 17, 1995 8:34 PM
To: cronus
Subject: Foundry Data/New WWW page

To: Cronus

The foundry pages on the Web (chip->cronus->process) have been updated. News includes:

- new versions of CSM 0.6um 3LM 5V design rules and mask tooling data on 6/27.
- CSM will give us E-test structure data.
- We will tape out in MEBES format to both foundries.
- CSM is coming up the yield curve, but would have some trouble with our large die size if we taped out today.
- TSMC has a 0.5um, 3.3V process available. We have design rules and other documents.

The WWW pages include contacts, a list of documents on file, status, and meeting minutes.

Regards,
Jack

From: vanthof (vant)
Sent: Saturday, July 15, 1995 2:07 AM
To: lisar; tbr; technology-checkins-dist; tom; vanthof
Subject: technology/mobimos/iss abs34_waf.vc abs23_drc.vc abs34_drc.vc contped_drc.vc
contped_grow.vc contped_waf.vc defines.h metal1_drc.vc metal1_perf.vc metal1_waf.vc
metal2_perf.vc metal2_waf.vc metal3_drc.vc metal4_drc.vc metal4_perf.vc metal4_waf.vc
mobidrc1

Update of /p/cvsroot/technology/mobimos/iss In directory
hestia:/N/rama/s4/vanthof/chip/technology/mobimos/iss

Modified Files:

abs23_drc.vc abs34_drc.vc contped_drc.vc contped_grow.vc
contped_waf.vc defines.h metal1_drc.vc metal1_perf.vc
metal1_waf.vc metal2_perf.vc metal2_waf.vc metal3_drc.vc
metal4_drc.vc metal4_perf.vc metal4_waf.vc mobidrc1_master.vc
mwap_drc.vc via12_grow.vc via12_perf.vc via12_waf.vc
via23_grow.vc via34_grow.vc via45_grow.vc via45_perf.vc Added Files:
abs34_waf.vc

Log Message:

clean up abs comments. Differentiated between tapeout and not for abs checks.
changed via growing from 5 udrs to 4 udrs to help put things back on grid and to keep
metals from getting 'wide'

From: wingard (Drew Wingard)
Sent: Friday, July 14, 1995 5:01 PM
To: woody
Cc: geert; tbr
Subject: Re: cronus homepage

Jay sez:

> The theory behind the cronus homepage is good, the only problem is
> that there is a lot of useless information. For example the logic
> mapping process flow-chart is helpful, whereas the information for most of the 'Custom
Blocks'
> is useless. Is the intention to eventually (i.e. before tapeout)
> update the appropriate pages?
>
> thanks,
> woody

If I had a big enough stick...

I would very much like to get the documentation system into a better state.
I spent a fair amount of time getting it to where it is, and I think it's pretty usable
and user-friendly.

Now we just need to convince our designers to ENTER THE DATA.

I think that one of the things we really should do is highlight some of the differences
between Cronus and Euterpe, while we still remember them!

I look forward to your first addition.

Drew

From: Derek Iverson [doi]
Sent: Friday, July 14, 1995 12:45 PM
To: pandora; hestia
Subject: Software Bringup Meeting Minutes - July 12, 1995

The first thing you may notice is that the published format of these minutes has changed....

The time of future Software Bringup meetings has been changed to 3:00pm from the previous time of 2:00pm.

Lisar commented that she was able to build the OSF kernel and was in the middle of running it on the IKOS.

Ethan has modified the software simulator to reflect the power-on state of cerberus registers.

Jeffm posted a note to the euterpe group summarizing his investigation into why the software and hardware simulators got such varying run times for the regdepend tests. Here is a summary of his findings (I sucked these lines out his posting to muse.euterpe).

There are three differences that I have noticed so far:

- 1: terp does not get a hazard when the pre-event pc is stored to right before the bback (same cyl). The store issues ten minor cycles before the bback issues. The hw hiccups.
2. terp models exception entry as taking 13 major cycles. The average seems to be a bit higher (15).
3. terp does not model the effect of ifetch page crossing (a mid- pipe hiccup that causes a 4(?) major cycle interruption in instruction flow). The ifetch page size is the minimum (64bytes).

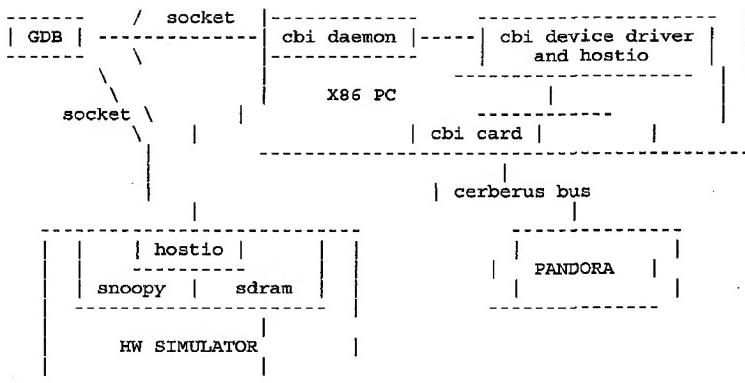
Unfortunately there are still differences beyond these, but I haven't tracked them down. The above three account for 80% of the difference in event handling timing, however.

The majority of the meeting was spent reviewing items on the Pandora bringup schedule.

- The software group will be able to make use the CBI device as early as Aug 4.
- If we want to have gdb to work with the HW simulators we will need to add hostio support to snoopy as well as decide what kind of interface snoopy will provide to gdb. In particular, should it have an interface similar to the CBI device driver?

Here is an attempt of representing the pieces of the gdb puzzle with an ascii diagram....





Using this configuration we will be able to

- o reset devices using either a cerberus reset or writing the reset bit.
- o load executables
- o causes a logic clear
- o get status from the print, status, and end octlets in cerberus space

It should also be noted that a special gdb stub will be required to enable remote debugging. This stub is loaded and run on euterpe and will handle all interactions with the user's gdb session.

During the very initial stages of bringup on the actual hardware, this gdb stub will not be used but instead the CBI device driver will be instructed to present a particular load image on a given cerberus address space. The remote machine will then boot this image and report it's status by using the print, status, and end octlets.

After the meeting Jeff and I were thinking it might be nice for the CBI device driver to understand and use what we in verification refer to as a 'cerb.in' file. This discussion will likely happen in the week prior to our next meeting.

We need to start filling in the plan for hardware, software, and mechanical bringup activities in the proposed bringup areas.

That is it for now.

From: vanthof (vant)
Sent: Wednesday, July 12, 1995 6:34 PM
To: hardheads
Cc: vanthof (Dave Van't Hof)
Subject: minor bug fixes in mobi drc flow

There have been a few reported false errors with the previous mobimos drc flow.

- max metal4 space
- via45 offgrid
- via34 support by metal3

These have been fixed.

A significant change in how wide metals are handled in the drc flow has been turned on with the latest release. At tapeout, we perforate all wide metals with a 'basket weave' pattern of 1.5x4.5 micron holes. There are cases where the perforation cannot be achieved because of interactions with below and above layers. The drc flow now perfs all wide metals (Greater than 4.5 microns) and then does a maximum metal width check. There will be errors generated in the current layouts. We cannot guarantee 100% perfect perforation and by putting this in the drc flow, we will find out early (before tapeout) and fix them.

A minor note about the new qdrc script. This script runs the exact same drc flow as rdrc does, but without the 14 dracula checks.

If any new problems or questions come up about the new drc flow, please let me know.

Thanks
Dave

--
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089
vanthof@microunity.com 1 408 734-8100
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just not in this context." The Tick to Thrackazog

From: jack (Jack Wenstrand)
Sent: Wednesday, July 12, 1995 6:16 PM
To: tony; geert; tbr; bill; al; wingard; todd@nara.com
Cc: jack; mous
Subject: Cyrix Meeting Agenda

Here is the final agenda for the Cyrix meeting tomorrow.

Regards,
Jack

Logistics:
War Room
3:00 -
Thursday, July 13, 1995.

Attendees:
Cyrix:
Kevin McDonough, VP Engr.
, CAD Mgr.
MU:
Drew, Tony, Geert, Tim, Bill, Al
Todd Morgenthaler

Background:
Cyrix has their own x86 designs, currently being fabbed by SGS Thomson and IBM. They are using IBM's CM4LC 0.6 um process (their die is now 394 mm² in this process) and moving to the CMSS 0.5 um process. This process has a 1.2 um metal pitch at metal one, and 1.8 um for 2-4.

A previous meeting with Steve Domenik of Cyrix has created some interest. Kevin will want to evaluate our technical merit.

Objective:
Send them home understanding that our technology could put them ahead of Intel. They should understand that Mobimos offers a significant performance boost for their processor over any other technology available in the near future, and that we have a road-map to stay ahead.

Agenda:

While you are welcome to attend the entire meeting, you are welcome to conserve time by only attending the sections for which your name appears below.

- 3:00 Tony
Review agenda
Overview of the microunity story.
Key process performance metrics.
Euterpe plot. Transistor counts.
- 3:20 Al
Mobimos, dense and fast.
- 3:50 Bill
Mobimos circuit family.
- 4:20 Tim
CAD and methodology.
- 4:40 Tim, Geert, Drew
Review of Cyrix needs, methodology, and

die plots.

5.30 Discussion

From: stick (Bruce Bateman)
Sent: Wednesday, July 12, 1995 6:05 PM
To: bill; wingard
Cc: geert; manser; mous; tbr
Subject: Re: draper/issc panel interconnect nightmare

> Date: Wed, 12 Jul 1995 15:47:42 -0700
> From: wingard (Drew Wingard)
> To: bill
> Subject: Re: draper/issc panel interconnect nightmare
> Cc: geert, manser, mous, stick, tbr
>
> Bill wrote:
> > i just got a call from don draper.. he is on isscc program committee
> > and is trying to put a panel together titled "interconnect nightmare".
> >
> ><snip>
>
>
> Au contraire. I suggested at the ISSCC committee meeting that Don
> call MicroUnity precisely because I thought that:
>
> 1. We have an interesting solution to the "interconnect nightmare".
> 2. A couple of SEM's of 4+1 layer 1um pitch airbridged gold (built using .5um
> lithography) would give the designers in the crowd the impression that
> MicroUnity offers some die-and-wake-up-in-heaven process technology to
> work with. In other words, it could help us staff our future projects.
> We won't get many opportunities to try and attract circuit/logic designers
> by showing them our process, since most circuit-oriented technical forums
> focus on circuits, not the underlying technologies.
>
> Regards,
> Drew
>

I would totally agree - IF we could be confident that we'd have it up and running in some form or another by then. But realistically speaking, this would be a gamble. We could very easily end up spending the next six months just concentrating on getting the non-air-bridge metal working well enough that we can produce and debug caliope/euterpe/mnemo/etc. I suspect that air-bridge will have to remain on the back burner until then. And then we could spend months trying to get it to work. Thus, it may not be there yet come next February.

BB

From: lisar (Lisa Robinson)
Sent: Tuesday, July 11, 1995 10:25 PM
To: manser; geert; tbr; drew; hopper; mudge; jack
Subject: cronus schedule in your mailbox

I have placed a (somewhat recovered!) cronus schedule in your mailboxes. It has been filtered upon "not completed". If there are tasks that have been completed, let me know. I have leveledized the schedule but selectively, most tasks are not prioritized. I was reluctant to distribute a schedule that had had the delay removed since there were so many overallocations of resources which gave an unrealistic tapeout date (with the current resources).

This is something that we should discuss tomorrow.

Lisa R.

From: wampler (Kurt Wampler)
Sent: Tuesday, July 11, 1995 1:16 PM
To: tbr
Cc: geert; vanthof
Subject: Re: Full chip LVS

tbr writes:

>Conensus seems to be we should attempt another euterpe full chip LVS.
>I have a version of the route completed in the snapshot area. It's not
>as good from a timing perspective as the one I have locally, but it has
>been built using the latest snapshot proteus and the newly updated
>snapshot euterpe, so I would recommend we work from that one.
>It has order 55 dicsonnects which would need to be completed.

>
>Kurt, can you attempt that please? There should be a corresponding
>splvs netlist already there.

I will try to route it to completion. Can you give me an idea of
how careful I should be? Since the baseplate itself is undergoing
edits, I suspect that we wouldn't tape out from this route?

>In addition to just making the remaining hookups, can you form some
>assessment of how difficult these are and what the expected additional
>impact on bad timing paths would likely be?

This depends too on how careful I am. (For example, whether I am
permitted to use the rip-up router, or whether I have to hand rip
and guarantee that no net I rip and put back gets worse.)

>In my local area I have som experimental changes which may improve
>things further and I will press ahead there without touchin the
>snapshot for a while.

- Kurt

From: lisar (Lisa Robinson)
Sent: Monday, July 10, 1995 3:54 PM
To: manser
Cc: geert; hooper; jack; tbr
Subject: Cronus schedule

The last level I performed on the schedule pushed the tapeout date to 2049! There appears to be no reason for this (other than corruption) and indeed taking out the delay doesn't. It will take me a while to recover.

LIsa R.

From: tbr
Sent: Sunday, July 09, 1995 8:21 PM
To: hopper (Mark Hofmann)
Cc: geert (Geert Rosseel); vant
Subject: Re: Euterpe timing status

Mark Hofmann wrote (on Sun Jul 9):

Tim B. Robinson writes:

Just a brief update on the current status of the euterpe physical design.

Our best routing result to date is such that by manually adjusting about 10 paths we can get within 200ps of the magic GHz based on our current best models. We are continuing to work this by running additional timing optimization/routing iterations while we wait for the DRC rules and fracture flow to be finalized.

At that point we will not delay the first tapeout based on any remaining timing violations.

~~~~~

Definitely worth monitoring!

Tim

Is your feeling that you would like to try a few more iterations/experiments before we do another round of LVS? Would it be worth connecting up the disconnects sloppily in order to run an LVS just to check things?

It would be worth a check. Also to see how horrendous the remaining 55 are. I have a run going in the snapshot. Should be out sometime during the night. It's off the same version as my last run in my area except that it does not have the -U topt flag so I'm expecting it to be worse.

I believe there is still, perhaps considerable, DRC work to be done on Euterpe. The amount of DRC work depends to what rules we decide we want to tape out to.

-hopper

---

**From:** tbr  
**Sent:** Sunday, July 09, 1995 8:19 PM  
**To:** hopper (Mark Hofmann)  
**Cc:** billz (Bill Zuravleff); dickson (Richard Dickson); geert (Geert Rosseel); lisar (Lisa Robinson); mws (Mark Semmelmeyer); wampler (Kurt Wampler); woody (Jay Tomlinson)  
**Subject:** Re: latest route

Mark Hofmann wrote (on Sun Jul 9):

Tim B. Robinson writes:

The 4th iteration completed. Violations down again to 291 paths (from 360 last time). Worst case is off by 1400ps, but fixing the 10 worst paths would get us within 200ps. There were 55 disconnects.

Better and better!

What about the first derivative of the number of timing violations? Is it beginning to taper off?

3600, 1600, 1200, 360, 291

Theres a lot of fluctuation. I could be tempted to draw a straight line saying it goes down by 1/2 each time on average . . .

Tim

---

**From:** hopper (Mark Hofmann)  
**Sent:** Sunday, July 09, 1995 11:00 AM  
**To:** Tim B. Robinson  
**Cc:** vant; geert (Geert Rosseel)  
**Subject:** Re: Euterpe timing status

Tim B. Robinson writes:

Just a brief update on the current status of the euterpe physical design.

Our best routing result to date is such that by manually adjusting about 10 paths we can get within 200ps of the magic GHz based on our current best models. We are continuing to work this by running additional timing optimization/routing iterations while we wait for the DRC rules and fracture flow to be finalized.

At that point we will not delay the first tapeout based on any remaining timing violations.  
^^^^^

Definitely worth monitoring!

Tim

Is your feeling that you would like to try a few more iterations/experiments before we do another round of LVS? Would it be worth connecting up the disconnects sloppily in order to run an LVS just to check things?

I believe there is still, perhaps considerable, DRC work to be done on Euterpe. The amount of DRC work depends to what rules we decide we want to tape out to.

-hopper

**From:** hopper (Mark Hofmann)  
**Sent:** Sunday, July 09, 1995 10:52 AM  
**To:** Tim B. Robinson  
**Cc:** lisar (Lisa Robinson); sysadm; vant; wampler (Kurt Wampler)  
**Subject:** Re: /n/tmp

Tim B. Robinson writes:  
Yes.

It has been planned to move it there for a long time, but with the availability problem of the drives a while back we did not do it. Ken has said he will do it this week.

Great! I think we will realize an immediate benefit with this.

You may remember before the most recent crunch, we almost did it but ran into the technical consideration of how to do it without disrupting things that were actively using it. This time I think we just bite the bullet, say when, and move it. It may make sense to co-ordinate this with the planned upgrade installation.

Hmm.. True. Do we have an official date/time for that now? I recall it was to be a Thursday evening about 2 weeks (1 week now?) hence.

As regards Disksuite, the Auspex has had that functionality and more since inception (ie virtual partitions, striping, mirroring etc).

The reluctance to go to truly huge partitions (we now use 4.5GB as the standard) is because of backup and restore issues and how long we would want a substantial number of users to be down after a major failure. You may remember the one time we did have a drive failure 30 users were down about 24 hours, though much of that should have been unnecessary had we been better prepared (I think we now are).

Right. Though I was thinking about a large /tmp partition where we would not have backup/restore issues, having large partitions everywhere would be a real boon for disk management.

Later this year auspex should be releasing software which will offer true raid capabilities which would reduce this consideration since a single drive failure would not then require any tapes to be visited. They have not given a release date yet, but we did make budget provision for this.

Very good.  
I believe the Alpha system offers something like this, though I'm unclear on the details.

Tim

-thanks,  
hopper

---

**From:** tbr (Tim B. Robinson)  
**Sent:** Sunday, July 09, 1995 11:38 AM  
**To:** euterpe  
**Subject:** Euterpe timing status

Just a brief update on the current status of the euterpe physical design.

Our best routing result to date is such that by manually adjusting about 10 paths we can get within 200ps of the magic GHz based on our current best models. We are continuing to work this by running additional timing optimization/routing iterations while we wait for the DRC rules and fracture flow to be finalized. At that point we will not delay the first tapeout based on any remaining timing violations.

Tim

**From:** tbr  
**Sent:** Sunday, July 09, 1995 11:12 AM  
**To:** hopper (Mark Hofmann)  
**Cc:** lisar (Lisa Robinson); sysadm; vant; wampler (Kurt Wampler)  
**Subject:** /n/tmp

Mark Hofmann wrote (on Sun Jul 9):

Hi,

Isn't the bottom line on all this that /n/tmp ought really to be on the auspex? /n/tmp on rama has served us well to this point, but the Auspex is better set up to deal with lots of large data requests as a disk server. And disk is cheap enough that we ought to consider using Auspex disk for this tmp function. BTW: can we put DiskSuite on the Auspex?

Yes.

It has been planned to move it there for a long time, but with the availability problem of the drives a while back we did not do it. Ken has said he will do it this week. You may remember before the most recent crunch, we almost did it but ran into the technical consideration of how to do it without disrupting things that were actively using it. This time I think we just bite the bullet, say when, and move it. It may make sense to co-ordinate this with the planned upgrade installation.

As regards Disksuite, the Auspex has had that functionality and more since inception (ie virtual partitions, striping, mirroring etc).

The reluctance to go to truly huge partitions (we now use 4.5GB as the standard) is because of backup and restore issues and how long we would want a substantial number of users to be down after a major failure. You may remember the one time we did have a drive failure 30 users were down about 24 hours, though much of that should have been unnecessary had we been better prepared (I think we now are).

Later this year auspex should be releasing software which will offer true raid capabilities which would reduce this consideration since a single drive failure would not then require any tapes to be visited. They have not given a release date yet, but we did make budget provision for this.

Tim

---

From: geert (Geert Rosseel)  
Sent: Friday, July 07, 1995 8:57 AM  
To: pollux  
Subject: Pollux Status + Meeting

Hi,

Can we get together today at 2:00 to discuss Pollux status (Conference Room next to Hopper) ?

---

I ran LVS and DRC on all released modules in /u/chip

LVS :

```
mod1      : cap mismatches
mod2      : clean
mod3      : clean
mod4      : clean
mod5      : cap mismatches
mod6      : 8 un-matches devices
mod7      : 7 un-matches devices, substrate problem
mod8      : lot's of errors
mod9      : clean
mod10     : clean
mod11     : clean
mod12     : clean
```

DRC is still running : here are the partial results

```
-rw-rw-rw- 1 geert      41178 Jul  7 02:56 mod1.err
-rw-rw-rw- 1 geert      10973 Jul  7 02:49 mod2.err
-rw-rw-rw- 1 geert      16998 Jul  7 02:46 mod4.err
-rw-rw-rw- 1 geert      79717 Jul  7 03:46 mod5.err
-rw-rw-rw- 1 geert      184504 Jul  7 06:13 mod6.err
-rw-rw-rw- 1 geert    12607941 Jul  7 04:32 mod7.err
```

1. LVS is a very high priority .. Toplevel LVS is a critical path to tape-out ...

Arya and Rich/Mudge : can you work on 6,7 today,  
mod6/mod7 problems may be due to un-released layouts.  
Please check solo's list of un-released layouts (on Mosaic).

2. DRC : is looking not too badly again

obviously : mod7 needs immediate attention.  
Rich, Mudge : do you need layout help on this ?  
Can we get this started early this morning. ?

All results are in :

/u/geert/compass/polluxrel

Geert

*Subject: Backend tapeout*

---

**From:** paulp (Paul Poenisch)  
**Sent:** Thursday, July 06, 1995 1:39 PM  
**To:** geert (Geert Rosseel); tbr (Tim B. Robinson); vanthof (Dave Van't Hof); wampler (Kurt Wampler); hopper (Mark Hofmann); tom (Tom Laidig)  
**Subject:** Re: backend tapeout questions

It looks like everyone can make it at 1:00 today. Kurt did say that he would have to leave at 1:30 but hopefully we can get all the issues on the table before he has to go. So let's meet today at 1:00 in the west hardware engineering conference room.

Paul.

---

**From:** tom (Tom Laidig [tau])  
**Sent:** Thursday, July 06, 1995 11:12 AM  
**To:** Paul Poenisch  
**Cc:** geert (Geert Rosseel); hopper (Mark Hofmann); wampler (Kurt Wampler); vanthof (Dave Van't Hof); tbr (Tim B. Robinson); tau  
**Subject:** Re: backend tapeout questions

Paul Poenisch writes:

It looks like most people can make a meeting at 4:00 today (I haven't heard from everyone yet but sofar no one has had a problem with that time). However Tim has suggested that we have it at 1:00 rather than 4:00, I would prefer it earlier if possible. Let's plan on 4:00 but if everyone is avialable at 1:00 I would like to move it to that time. If you don't here from me it will be at 4:00 (in the hardware engin. west room).

1PM is good for me. 4PM is OK, but I want to leave not much later than 5.

--

'\'

---

**From:** vanthof (vant)  
**Sent:** Thursday, July 06, 1995 11:02 AM  
**To:** Mark Hofmann  
**Cc:** tbr (Tim B. Robinson); hopper (Mark Hofmann); wampler (Kurt Wampler); tom (Tom Laidig); vanthof (Dave Van't Hof); geert (Geert Rosseel)  
**Subject:** Re: backend tapeout questions

Mark Hofmann writes:

>  
>Paul Poenisch writes:  
>  
> It looks like most people can make a meeting at 4:00 today (I haven't heard  
> from everyone yet but sofar no one has had a problem with that time).  
> However Tim has suggested that we have it at 1:00 rather than 4:00, I would  
> prefer it earlier if possible.  
> Let's plan on 4:00 but if everyone is avialable  
> at 1:00 I would like to move it to that time. If you don't here from me it  
> will be at 4:00 (in the hardware engin. west room).  
>  
> Paul.  
>  
>lp is fine with me.  
>

lpm is fine with me too.

--  
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089  
vanthof@microunity.com 1 408 734-8100  
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just  
not in this context." The Tick to Thrackazog

---

**From:** hopper (Mark Hofmann)  
**Sent:** Thursday, July 06, 1995 4:00 AM  
**To:** Paul Poenisch  
**Cc:** tbr@microunity.com; geert (Geert Rosseel); tom (Tom Laidig); wampler (Kurt Wampler); vanthof (Dave Van't Hof)  
**Subject:** Re: backend tapeout questions

Paul Poenisch writes:

It looks like most people can make a meeting at 4:00 today (I haven't heard from everyone yet but sofar no one has had a problem with that time). However Tim has suggested that we have it at 1:00 rather than 4:00, I would prefer it earlier if possible.  
Let's plan on 4:00 but if everyone is avialable at 1:00 I would like to move it to that time. If you don't here from me it will be at 4:00 (in the hardware engin. west room).

Paul.

lp is fine with me.

-hopper

---

**From:** paulp (Paul Poenisch)  
**Sent:** Thursday, July 06, 1995 10:25 AM  
**To:** Tim B. Robinson  
**Cc:** geert (Geert Rosseel); hopper (Mark Hofmann); tom (Tom Laidig); wampler (Kurt Wampler); vanthof (Dave Van't Hof)  
**Subject:** Re: backend tapeout questions

It looks like most people can make a meeting at 4:00 today (I haven't heard from everyone yet but sofar no one has had a problem with that time).  
However Tim has suggested that we have it at 1:00 rather than 4:00, I would prefer it earlier if possible. Let's plan on 4:00 but if everyone is avialable at 1:00 I would like to move it to that time. If you don't here from me it will be at 4:00 (in the hardware engin. west room).

Paul.

---

**From:** tbr  
**Sent:** Wednesday, July 05, 1995 10:01 PM  
**To:** paulp (Paul Poenisch)  
**Cc:** geert (Geert Rosseel); hooper; tom (Tom Laidig); vanthof (Dave Van't Hof); Kurt Wampler  
**Subject:** Re: backend tapeout questions

Paul Poenisch wrote (on Wed Jul 5):

It looks like tomorrow morning is out due to staff meetings and other problems. Also early afternoon is out due to a meeting with photonics. I have an interview from 3:15 to 4:00 so it looks like the earliest we could do it is at 4:00 tomorrow. Can everyone make this time?

I can, but I still think 1-2 ought to be a viable alternative.

Tim

**From:** tbr  
**Sent:** Wednesday, July 05, 1995 10:00 PM  
**To:** wampler (Kurt Wampler)  
**Cc:** geert; hopper; paulp@microunity.com; tom; vanthof  
**Subject:** Re: backend tapeout questions

Kurt Wampler wrote (on Wed Jul 5):

Dave writes:

-----  
>I would like to have Geert and Tim at the meeting so they have some incling  
>as to the backend synthesis process.  
>  
>How about 1:30 tomorrow?

1:30 is perilously close to a 2PM that I'm supposed to attend at Photronics  
tomorrow with Jack Wenstrand. Late morning, or later in the afternoon fits  
better with my schedule.

Let's move it up to 1 and keep it to an hour.

Tim

---

**From:** paulp (Paul Poenisch)  
**Sent:** Wednesday, July 05, 1995 8:15 PM  
**To:** Kurt Wampler  
**Cc:** geert (Geert Rosseel); tbr (Tim B. Robinson); tom (Tom Laidig); vanthof (Dave Van't Hof); hooper  
**Subject:** Re: backend tapeout questions

It looks like tomorrow morning is out due to staff meetings and other problems. Also early afternoon is out due to a meeting with photonics. I have an interview from 3:15 to 4:00 so it looks like the earliest we could do it is at 4:00 tomorrow. Can everyone make this time?

Paul.

**From:** wampler (Kurt Wampler)  
**Sent:** Wednesday, July 05, 1995 7:21 PM  
**To:** paulp@microunity.com; vanthof  
**Cc:** geert; hopper; tbr; tom  
**Subject:** Re: backend tapeout questions

Dave writes:

>I would like to have Geert and Tim at the meeting so they have some  
>inclding as to the backend synthesis process.  
>  
>How about 1:30 tomorrow?

1:30 is perilously close to a 2PM that I'm supposed to attend at Photronics  
tomorrow with Jack Wenstrand. Late morning, or later in the afternoon fits  
better with my schedule.

- Kurt

---

**From:** vanthof (vant)  
**Sent:** Wednesday, July 05, 1995 6:27 PM  
**To:** Paul Poenisch  
**Cc:** tbr (Tim B. Robinson); tom (Tom Laidig); wampler (Kurt Wampler); hopper (Mark Hofmann); geert (Geert Rosseel); vanthof (Dave Van't Hof)  
**Subject:** Re: backend tapeout questions

Paul Poenisch writes:

>Thursday morning would be OK with me if the meeting is over before  
>10:00, I have a Castor2 meeting then. Also for my purposes I suspect  
>that Geert and you don't need to be at this meeting as what I would like  
>to get out of the meeting is an understanding of how the post  
>processing is to be done (as currently planned) rather than making any  
>decisions about it. However it's likely that others will want  
>different issues and topics discussed, if that's the case then maybe it should be moved  
to Thursday.  
>  
>Paul.  
>

Sorry for the delay in getting back to you on this.

I usually don't get in until 9:30 now, plus there are two staff meetings tomorrow morning:  
tbr's, then hopper's starting at 9:30.

Mornings are never very good for me.

I would like to have Geert and Tim at the meeting so they have some incling as to the  
backend synthesis process.

How about 1:30 tomorrow?

Dave

--  
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089  
vanthof@microunity.com 1 408 734-8100  
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just  
not in this context." The Tick to Throckmorton

**From:** paulp (Paul Poenisch)  
**Sent:** Wednesday, July 05, 1995 12:11 PM  
**To:** Tim B. Robinson  
**Cc:** tom (Tom Laidig); vanthof (Dave Van't Hof); hopper (Mark Hofmann); wampler (Kurt Wampler); geert (Geert Rosseel)  
**Subject:** Re: backend tapeout questions

>  
> Tom Laidig [tau] wrote (on Wed Jul 5):  
>  
> Paul Poenisch writes:  
>  
> | I would like to meet sometime today to discuss the issues that Dave has  
> brought up. I'm open all day except at 4:00.  
>  
> Sounds good. I'd like to leave by 5 today (the roofers are ripping the  
> old roof off my house today, and I want to sneak in some wiring work  
> tonight while the roof is out of the way), I'd prefer meeting before 4.  
>  
> Geert is out today and I suspect he'd be keen to participae in this  
> discussion so I wonder if it make more sense to schedule it for the  
> morning.  
>  
> Tim  
>  
>  
Thursday morning would be OK with me if the meeting is over before 10:00, I have a Castor2 meeting then. Also for my purposes I suspect that Geert and you don't need to be at this meeting as what I would like to get out of the meeting is an understanding of how the post processing is to be done (as currently planned) rather than making any decisions about it. However it's likely that others will want different issues and topics discussed, if that's the case then maybe it should be moved to Thursday.

Paul.

---

**From:** tbr  
**Sent:** Wednesday, July 05, 1995 11:51 AM  
**To:** tom (Tom Laidig [tau])  
**Cc:** geert (Geert Rosseel); hopper (Mark Hofmann); Paul Poenisch; tau; vanthof (Dave Van't Hof); wampler (Kurt Wampler)  
**Subject:** Re: backend tapeout questions

Tom Laidig [tau] wrote (on Wed Jul 5):

Paul Poenisch writes:

I would like to meet sometime today to discuss the issues that Dave has brought up. I'm open all day except at 4:00.

Sounds good. I'd like to leave by 5 today (the roofers are ripping the old roof off my house today, and I want to sneak in some wiring work tonight while the roof is out of the way), I'd prefer meeting before 4.

Geert is out today and I suspect he'd be keen to participate in this discussion so I wonder if it makes more sense to schedule it for the morning.

Tim

**From:** tom (Tom Laidig [tau])  
**Sent:** Wednesday, July 05, 1995 11:43 AM  
**To:** Paul Poenisch  
**Cc:** vanthof (Dave Van't Hof); hopper (Mark Hofmann); tau; wampler (Kurt Wampler); geert (Geert Rosseel); tbr (Tim B. Robinson)  
**Subject:** Re: backend tapeout questions

Paul Poenisch writes:

I would like to meet sometime today to discuss the issues that Dave has brought up. I'm open all day except at 4:00.

Sounds good. I'd like to leave by 5 today (the roofers are ripping the old roof off my house today, and I want to sneak in some wiring work tonight while the roof is out of the way), I'd prefer meeting before 4.

--

---

**From:** paulp (Paul Poenisch)  
**Sent:** Wednesday, July 05, 1995 11:29 AM  
**To:** vant; hooper; tom (Tom Laidig); wampler (Kurt Wampler)  
**Cc:** geert (Geert Rosseel); tbr (Tim B. Robinson)  
**Subject:** Re: backend tapeout questions

I would like to meet sometime today to discuss the issues that Dave has brought up. I'm open all day except at 4:00.

Paul.

**From:** vanthof (vant)  
**Sent:** Wednesday, July 05, 1995 11:28 AM  
**To:** Tom Laidig [tau]  
**Cc:** solo@microunity.com; hardheads; tau  
**Subject:** Re: new lvs and drc flow installed (minor tweaks)

Tom Laidig [tau] writes:

>  
>|dave, take a look at /u/solo/test/compass/cerpokgen.err and  
>|ceinv5.err. these are not very complex and look as if the m1 contact  
>rule is not doing the right job. maybe you are doing drc checks after  
>the 2udr shrink and these ar the "few" examples of the via and contact  
>on the edge of fat metal?? it does happen quite a few places.  
>  
>let me know.  
>  
>Those are some of the `few' examples of contact on the edge of fat  
>metal. This sort of thing is sprinkled around in various places, but  
>hey, there was only one error flag in each of the cells you mentioned!  
>So far, the situations like this I've fixed have been pretty easy, at  
>least.  
>

This is why the synthesis is part of the drc flow, to catch and fix these errors before tapeout.

Dave

--  
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089  
vanthof@microunity.com 1 408 734-8100  
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just  
not in this context." The Tick to Thrackazog

**From:** tbr  
**Sent:** Monday, July 03, 1995 1:18 PM  
**To:** wampler (Kurt Wampler)  
**Subject:** Re: Tape shipment.

Kurt Wampler wrote (on Mon Jul 3):

>If the offices are still all dark at 11, I'll come down.  
>Just let me know.  
>  
>Tim

An 11:10 survey of Juli, Grant, Jessica offices turned up no evidence of inhabitants -- all still dark. Sorry to provoke an unwanted commute.

The tapes are about half done writing. Assuming trex stays up, they should still be done around noon. I'll eat lunch here in the Cafe; I'll leave the package & tapes on my desk. Any time before 3PM is fine.

OK, no problem I'll leave shortly.

Tim

**From:** wampler (Kurt Wampler)  
**Sent:** Monday, July 03, 1995 1:14 PM  
**To:** tbr  
**Subject:** Re: Tape shipment.

>If the offices are still all dark at 11, I'll come down.

>Just let me know.

>

>Tim

An 11:10 survey of Juli, Grant, Jessica offices turned up no evidence of inhabitants -- all still dark. Sorry to provoke an unwanted commute.

The tapes are about half done writing. Assuming trex stays up, they should still be done around noon. I'll eat lunch here in the Cafe; I'll leave the package & tapes on my desk. Any time before 3PM is fine.

- Kurt

**From:** tbr  
**Sent:** Monday, July 03, 1995 12:17 PM  
**To:** wampler (Kurt Wampler)  
**Subject:** Re: Tape shipment.

Kurt Wampler wrote (on Mon Jul 3):

tbr writes:

-----  
>Is Grant available? If not, let me know and I'll come in. It will  
>take about an hour. What time do you expect to be ready?

Grant's, Jessica's, and Juli's offices are all dark as of 10AM this morning.  
I should have the tapes written and ready for approval by noon today.  
Photronics will be here at 3PM to have a short meeting and receive the  
tapes from us. Any time between noon & 3 would be fine.

I could certainly put copies of all of the FrameMaker documents and label  
files where you could review them on-line, though I realize that wouldn't  
allow you to check the physical labels. Let me know if you think an  
"electronic review" would be good enough.

If the offices are still all dark at 11, I'll come down.  
Just let me know.

Tim

~~Message tracking~~

---

**From:** wampler (Kurt Wampler)  
**Sent:** Monday, July 03, 1995 12:03 PM  
**To:** tbr  
**Subject:** Re: Tape shipment.

tbr writes:

---

>Is Grant available? If not, let me know and I'll come in. It will  
>take about an hour. What time do you expect to be ready?

Grant's, Jessica's, and Juli's offices are all dark as of 10AM this morning.  
I should have the tapes written and ready for approval by noon today.  
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files where you could review them on-line, though I realize that wouldn't  
allow you to check the physical labels. Let me know if you think an  
"electronic review" would be good enough.

- Kurt

From: vanthof (vant)  
Sent: Sunday, July 02, 1995 1:35 AM  
To: paulp (Paul Poenisch); al (Albert Matthews)  
Cc: vanthof (Dave Van't Hof); hopper (Mark Hofmann); geert (Geert Rosseel); tbr (Tim B. Robinson); wampler (Kurt Wampler); tom (Tom Laidig)  
Subject: backend tapeout questions (1 more item)

vant writes:

- ```
> 1) wide metal shrinking  
> 2) notch filling  
>  
> 3) via growing  
>  
> 4) via waffling  
>  
> 5) removal of small waffles on metals (not vias). Small is defined  
> as less than 1.5 x 1.5 microns.
```

I'd like to add one more item:

- 6) wide metal perforations

During the wide metal perforation process, because of upper and lower layer interactions, we can easily create holes that are less than 1.5x1.5 micron. If we are to meet the rule that no hole is less than 1.5 x 1.5 microns, then we can also create large sheets of metal which no holes at all.

A quick summary of the drc errors we will CREATE as a result of the 6 items I've mentioned:

- notches less than 1.5 microns
- holes less than 1.5 microns
- wide metals with no holes.
- wide metals spaced .5 microns to other metals.
- via layers with some dense and many sparse areas
- metal layers with large unwaffled areas (if we remove all small waffle bars)
- a non-drc issue is if we allow via growing, then there would be many .25 micron (or less) edges created.

Comments?

Dave

--  
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089  
vanthof@microunity.com 1 408 734-8100  
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just not in this context." The Tick to Thrackazog

**From:** hopper (Mark Hofmann)  
**Sent:** Saturday, July 01, 1995 6:14 PM  
**To:** paulp (Paul Poenisch); al (Albert Matthews); vanthof (Dave Van't Hof); geert (Geert Rosseel); tom (Tom Laidig); wampler (Kurt Wampler); tbr (Tim B. Robinson)  
**Subject:** Re: backend tapeout questions

Hi,

I've done some snipping to shorten my reply...

want writes:

Hello,

There have been many discussions about what to do and not to do during our back end synthesis lately, especially because sisyphus allowed us to generate examples of some of the synthesis. I would like to come to some sort of finality on some of these so I can proceed with completing the metal synthesis flow. I'd like to list the items first, then list what I believe to be the issues for each:

[snip]

item 4) via waffling. Via waffline has added a level of complexity to the backend synthesis not quite imagined. The generation of waffles for vias (and contped) does make wafflizing the metals much more difficult and in some cases quite impossible to accomplish. There are going to be large areas where we cannot add any via waffles because of the dense metal routing. The wafflization will then create a layer which may have many large/small low density areas with many large/small densely waffled areas. By removing via waffling, the back end synthesis becomes a known problem with existing solutions and minimal amount of work to integrate into the existing backend flow. I still don't have a back end waffle flow for upper metals. I have not had enough time to work on it yet and at my current rate of progress could take many more weeks.

In addition, we will have no way of verifying that the final back end metal pattern has not created a massive short since the resulting metal layers are far too large for any lvs tool to handle. We will have to trust that mere humans have done it right. Very scary.

Question is, do we still allow via waffles?

My feeling here is that whatever we end up with must be checkable by machine. Our processing is too complex to allow it to go forward without a check on each mask mod step. At the moment we still perform XOR mask checks after we have done all our synthesis. We ship the masks and do this XOR check afterward. The point is we do feel it is necessary not to trust our tools inherently, we always want to be able to double check ourselves if we can.

I would like to come to some resolution on these question rather quickly so I know where to focus my efforts for the back end synthesis.

Thanks,  
Dave

-hopper

**From:** hopper (Mark Hofmann)  
**Sent:** Saturday, July 01, 1995 6:06 PM  
**To:** tbr (Tim B. Robinson)  
**Subject:** backend tapeout questions (fwd)

Hi Tim,

Because of a typo I'm not sure you got this mail.

-hopper

vant writes:

Subject: backend tapeout questions  
To: paulp (Paul Poenisch), al (Albert Matthews)  
Date: Sat, 1 Jul 95 21:48:57 PDT  
Cc: vanthof (Dave Van't Hof), hopper (Mark Hofmann), geert (Geert Rosseel),  
tom (Tom Laidig), wamplerb  
X-Mailer: ELM [version 2.3 PL11]

Hello,

There have been many discussions about what to do and not to do during our back end synthesis lately, especially because sisyphus allowed us to generate examples of some of the synthesis. I would like to come to some sort of finality on some of these so I can proceed with completing the metal synthesis flow. I'd like to list the items first, then list what I believe to be the issues for each:

- 1) wide metal shrinking
- 2) notch filling
- 3) via growing
- 4) via waffling
- 5) removal of small waffles on metals (not vias). Small is defined as less than 1.5 x 1.5 microns.

item 1) wide metal shrinking. it's pretty stable at this time, however, we are seeing many cases where after the edges has been pulled back on wide metals, there are 3 or 4 udr (.15 or .2 micron) deep notches less than 1.5 microns wide created. The problem occurs when we notch fill these in. By filling the notches, we can easily bring back the wide metal to eliminate the notch, however, there could be another piece of metal spaced .5 microns away from the filled edge. This would give us wide metal next to other metal spaced at .5 microns. This does happen as I've seen it in some of our cells. The question is, is the wide metal next to small metal okay in some cases?

item 2) notch filling. The current notch filling algorithms will only fill notch areas which do not have connecting layers above or below crossing into or totally inside the notch area. This is to prevent shorts from occurring. Because routing in via layers is legal and the spacing is only 5 udrs from via to metal (or metal to via), and notches can go the entire width of the chip, we cannot properly determine if all of the via crossing into the notch is electrically connected. Thus the notch algorithm will not put metal over the

connecting layer. This could in fact create smaller notches and even small holes (holes as small as 8 x 24 udrs). However, notches which have no interactions with other layers will be filled, only notches which have some interaction with the connection layer will have parts of that notch left open. The notch filling could create min spaces from wide metals to narrow metals. Question is, do we still want to fill notches/holes (NOTE: we cannot tell the difference between a notch and a hole)

item 3) via growing. A review of the fractured data of sisyphus' contped layer revealed an edge pattern that was apparently not quite what was expected so no growing was performed on sisyphus. The results of growing other via layers will look just like sisyphus' contped layer. Question is, do we still want to do via growing?

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item 5) removal of small metal waffles. I ran some small tests on sisyphus which removed small metal waffle bars (less than 1.5 x 1.5). This resulted in many large areas (11x18 microns) which had no metal waffle bars. If we had waffled vial2 (like we will on euterpe), then the number of small metal waffle bars removed would increase by some amount resulting in even large areas with no waffle bars added. We've now converted very dense metal layers into relatively sparse layers which will fail the current metal density checks. Question is, do we want to remove small metal waffle bars and create large unwaffles areas in metals?

I would like to come to some resolution on these question rather quickly so I know where to focus my efforts for the back end synthesis.

Thanks,  
Dave

--  
Dave Van't Hof MicroUnity Systems Eng., Inc. 255 Caspian Sunnyvale, CA 94089  
vanthof@microunity.com 1 408 734-8100  
"I don't know the meaning of the word surrender! I mean, I know it, I'm not dumb... just not in this context." The Tick to Thrackazog

**From:** vanthof (vant)  
**Sent:** Saturday, July 01, 1995 11:51 PM  
**To:** vant  
**Cc:** wampler (Kurt Wampler); tbr (Tim B. Robinson)  
**Subject:** Re: backend tapeout questions

typo on the 'to:' line prevented you guys from getting this...

vant writes:

>  
>  
>Hello,  
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>during our back end synthesis lately, especially because sisyphus  
>allowed us to generate examples of some of the synthesis. I would like  
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>quickly so I know where to focus my efforts for the back end synthesis.

>Thanks,  
>Dave

>--  
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>"I don't know the meaning of the word surrender! I mean, I know it,  
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**From:** hopper (Mark Hofmann)  
**Sent:** Saturday, July 01, 1995 11:46 AM  
**To:** Tim B. Robinson  
**Cc:** wampler (Kurt Wampler)  
**Subject:** Re: sisyphus tape out

Tim B. Robinson writes:

Is this in connection with the ring osc, or the reall calliope M1?

<I just noticed the subject line, which I think answers that!>

Right- it's the sisyphus tape out.

The results will be ready for shipment Monday (and already have Al and Paul's blessing to just ship out the tapes.) will you be available to review the paperwork on Monday? Kurt and I discussed sending an postscript file of the paperwork to you for your review if you were planning on working remotely that day.

I was planning to be operating remotely Monday, but if there is no-one else there to authorize it I'll come in. To do it right, I really need to look at the tapes also, just to check the labelling etc.

Yes. Actually Kurt had the novel idea of maybe scanning in the labels and then sending you the image! I don't know if we could get our hands on the technology or not...

I haven't been able to talk to Grant (as a back up)-  
he's been in a meeting.  
So I'm not sure if he'll be around on Monday.

OK, what time do you expect them to be ready and to ship out? If grant, jessica, juli or lois are there I think any of them can OK it.  
If not, I need about an hour to get down.

Tim

Okay. I saw your mail about Lois being out. Maybe we can get Juli to do it.

-thanks,  
hopper

**From:** tbr  
**Sent:** Saturday, July 01, 1995 2:37 PM  
**To:** vanthof (vant)  
**Cc:** geert (Geert Rosseel); vanthof (Dave Van't Hof)  
**Subject:** Re: forwarded message from Mail Delivery Subsystem

vant wrote (on Sat Jul 1):

Tim B. Robinson writes:

>  
>  
>Must have been a typo here . . .

That's okay. I did get the message from the pollux alias. My latest release of layouts for pollux just finished and I wont be doing any more work on this until late tonight.

so a new getbom can be done at any time if Tom has not done the tar tape yet.

OK. I'll pick it up as soon as the make get's past the current step.

Tim

~~SECRET~~

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**From:** vanthof (vant)  
**Sent:** Saturday, July 01, 1995 2:25 PM  
**To:** Tim B. Robinson  
**Cc:** vanthof (Dave Van't Hof); geert (Geert Rosseel)  
**Subject:** Re: forwarded message from Mail Delivery Subsystem

Tim B. Robinson writes:

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**From:** tbr  
**Sent:** Saturday, July 01, 1995 2:23 PM  
**To:** vanthof (vant)  
**Cc:** pollux; tom (Tom Laidig); vanthof (Dave Van't Hof)  
**Subject:** Re: Another mobimos drc flow release

vant wrote (on Sat Jul 1):

Tim B. Robinson writes:

> vant wrote (on Sat Jul 1):

> they are most likely valid, as I believe I've now reduced the number of false  
> errors to a minimum. However, I made several edits to many cells late last  
> night and early this morning, then restarted all module drc runs. Only  
> mod8, 11, and 12 are left to finish up. Here are the current stats:

>  
> Does this mean that the proteus snapshot bom I got last night in  
> preparation for tom's tar copy for pollux is invalid?

>  
>I took BOM 5.1525 and I see we are now at BOM 5.1527

Yes, I'm afraid so. I made many edits to several cells for pollux. I was not able to completely clean them up, so there will be more edits over the weekend. Tom is out at the moment, so another getbom would catch things before his tar tape, unless of course, he has already completed the tar.

No, he's waiting on the make to complete. I'll kill it, get the new bom and restart.

Tim

Project Alpha

---

From: tbr  
Sent: Saturday, July 01, 1995 2:21 PM  
To: hopper (Mark Hofmann)  
Cc: wampler (Kurt Wampler)  
Subject: sisyphus tape out

Mark Hofmann wrote (on Fri Jun 30):

Hi Tim,

We notice that we omitted to get rid of the MWAP layer over the cache area on the calliope baseplate. The result is that contped and metall did not get waffled in that area. Al is concerned that this large hole may peel and harm other active area. Therfore we are going to start a re-fracture of these 2 layers tonight.

Is this in connection with the ring osc, or the reall calliope M1?

<I just noticed the subject line, which I think answers that!>

The results will be ready for shipment Monday (and already have Al and Paul's blessing to just ship out the tapes.) Will you be available to review the paperwork on Monday? Kurt and I discussed sending an postscript file of the paperwork to you for your review if you were planning on working remotely that day.

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**From:** vanthof (vant)  
**Sent:** Saturday, July 01, 1995 2:03 PM  
**To:** Tim B. Robinson  
**Cc:** pollux; tom (Tom Laidig); vanthof (Dave Van't Hof)  
**Subject:** Re: Another mobimos drc flow release

Tim B. Robinson writes:

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